COMPARISONS OF BODY MEASUREMENTS OF CERTAIN BOYS SIX TO FOURTEEN YEARS OLD WITH MEASUREMENTS OF SELECTED GARMENTS OF CORRESPONDING SIZES

by

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TABLE OF CONTENTS

INTRODUCTION

The fifteenth census of the United States revealed that 21 per cent of the total population of the United States was between the ages of 5 and 14 years. About half of that number, it may be assumed are boys, so that at least 10 per cent of the population of the United States at the present time are boys between the ages of 5 and 14 years. Since a large proportion of the wardrobe of boys is now purchased ready-made, it is important that a study be made of some of the problems confronting the persons who are purchasing agents for this group. One of the most trying problems is to find garments of the proper size.

Children of the same age often vary in size and body proportions to a marked degree. Measurements now in use in the sizing of garments of the ready-to-wear trade and of commercial patterns are guesses which have grown up in the industries concerned. Bond[1], who has made a careful survey of the available standards for clothing sizes, says that any measurements that have been taken have been secured by sales clerks or employees of dress-form manufacturers, or

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[1]Program of the Mutual Broadcasting Company. March 8, 1939.

others totally untrained in anthropometry and with no appreciation of the methods and instruments which should be used in studies of this kind.

Yane (1938) reports a study made by the United States Department of Labor in which the status of the standards for sizing of ready-made garments was presented. The section, in its study of the problem, has brought together the findings of various government bureaus on this subject as well as experiences of trade organizations. Parts of these findings are here given. Some stores and manufacturers were found to have a system of sizes that was used in making up the garments for their organization. Two of the stores visited in collecting data for the study pointed with pride to the fact that their companies had furnished the manufacturers of the garments they had for sale with a set of garment specifications. These included measurements of garments. In neither case were these sizes available to the public. This bears out the statement that such systems of sizing as are now in existence are kept as trade secrets and lack uniformity.

The measurements quoted as accurate by these manufacturing groups have been taken with ordinary commercial tape measures, with no consideration of the amount of

clothing the individual had on at the time the measurements were taken, no definite body landmarks were used, and no account was made of the number of persons measured (Yane, 1938). Some merchants are aware of the lack of scientific garment sizes. According to the same authority this is shown by the experiences of the director of testing laboratories of one of America's great retail establishments. In attempting to arrive at size specifications for children's garments sold by her organization she collected all available data on body measurements and made tables of averages. After several months of work it was concluded that the available measurements were not applicable to clothing problems since they had been taken from the health standpoint. Most of the data concerned height and weight, circumference of chest and head. It was found that authorities varied in their methods of taking measurements.

That the situation with regard to sizes is an extremely serious one and that something needs to be done is conceded by all concerned. The National Bureau of Standards, at the request of interested trade associations, has formulated a set of standards for men's pajamas, boys' blouses, knit underwear and dress patterns. These

standards while not compulsory, can be used by manufacturers in producing such garments.

In November, 1937 a tentative draft of a proposed commercial standard for women's dresses was proposed. All these are steps to inform the consumer of sizes. It does not mean that the best system of sizes which can be devised has been adopted, in as much as no system based on really scientific study of body measurements has yet been tried for civilians of the United States. The United States Army and Navy, (Nystrom, 1928) made one such study of 100,000 enlisted men. The Government has made sailors' uniforms in three sizes over specified measurements for many years and at the close of the World War some standards were set up for soldiers' uniforms, but these measurements were not adaptable to the construction of civilian clothing.

It was not until 1937 that money was obtained and definite plans formulated for a scientific study of body measurements to be conducted by the United States Bureau of Home Economics. The Bureau's project, which is at present underway, calls for the measuring of 100,000 children of both sexes at age levels from 6 to 14 years, in eight selected regions of the United States. O'Brien (1937) said, "Anthropometry will help fit Johnnie's clothes." The

project was planned as a contribution of Home Economics, not only to the solution of consumer's problems, but also one of importance to everyone along the line, from manufacturer to consumer. Davis (1937) states that a conference was held with representatives of the anthropological societies, manufacturers of garments, pattern makers and home economists, in New York City, early in 1937. Later representatives from a number of colleges and universities were called together to continue the work. The object was to find a "cross section of American childhood", not for height and weight only, but in 36 other physical traits. It was decided by the group that American children should have American clothing that would fit.

The American clothing industry is still in its infancy as it has been less than one hundred years since clothing in quantities has been manufactured for public consumption. Ready-to-wear trade was gaining in momentum by the first of the present century but the World War curtailed the production of women's and children's garments, because the factories were busy making soldiers' clothing and uniforms. Soon after the close of the war the factories were flooded with orders for civilian clothing (Nystrom, 1928). The wild spending orgy that followed the war, came to an end in

1920. In 1921 the depression hit the manufactures. The "jobber" was gaining a foot hold. He secured contracts for the construction of certain garments and sublet these to smaller manufacturers. This started cut-throat competition. We find skimping of materials in garments so that they were frequently under sized, cheap materials of inferior quality were used, poor workmanship resulted, and less attention was paid to inspection of the quality of work.

Ohrbach (1937) says, "Do not be misled by marked sizes. Trying on is the only answer." Sizes do not run true to the markings. Some of the better grades do follow a sort of standard set of measurements but the product of various companies differs, and where there are a handful of makers who follow a standard, there are a myriad of others who skimp the cut and label any size that suits their fancy. Saum (1925) says that size standards would offer the possibility of unusually large savings in the manufacturing of clothing. It is a problem concerning designers, manufacturers, retailers and consumers. Standard sizes would result in a better looking, neater fitting garment and eliminate much expense for alterations. Standardization of garment sizes offers possibilities of

large savings to the clothing manufacturers as it means taking substandard goods out of competition with standard goods. Standards carried out scientifically would not only help break down sales resistance because of the resulting better looking garments, but would cut down on the retailers' expenses.

In a study of returned goods made by Bush (1934) women's and children's clothing account for over 40 per cent of the merchandise returned. The reason most frequently given for the return of this merchandise was "wrong size". A survey of returned goods problem in Boston revealed that approximately 22 per cent of the merchandise returned during the period studied was unsatisfactory because of irregularities of size.

An indication of the costliness of returned goods transactions is furnished by the Ohio State University Bureau of Business Research (1926)[2]. Not less than 23 persons are required to perform the transactions involved in a charge purchase delivered and picked up for exchange, by a department store. The cost of charge transactions varied from 32 to 62 cents, being slightly more expensive

[2]Cost of Handling Merchandise Returns, 1926. (Report of a special study of the problem by the University in co-operation with twenty-seven Ohio department stores).

than cash transactions. However, the greatest losses occur from the necessity of reselling returned merchandise at considerable reduction of the original price.

The purpose of this study has been to study the measurements of a selected group of Kansas boys from each of the six age groups, 6, 8, 10, 12, 13, and 14 years, and to compare these measurements with the corresponding measurements of shirts and trousers of specified design made by ten garment manufactures.

REVIEW OF LITERATURE

In making a comparative study of the body measurements of boys and the corresponding measurements of certain garments, the chief concern is how will the garment fit. The fit of the garment depends largely upon how the garment is cut, and the pieces assembled in such a manner as to make a covering for various members of the human body. Adequate tolerance for ease and comfort when the body is in motion must be allowed. The designing and construction of garments necessitates a knowledge of body proportions. The study of the structure and proportions of the human body is termed anthropometry. Penniman (1936) defines anthropology

as "the science of man, a master science embracing, first, such biological studies as help to explain what man is and was, and his place in the realm of animated nature. These studies shade into a second group, that of psychological studies."

Wilder and Pfieffer (1924) in tracing the history of anthropometry states that White in 1794 considered the forearm bones of the negro to be longer in proportion than those of the white man. With this statement the science of comparative anthropometry was inaugurated. Differences in body proportions of this sort seem to have been unrecognized before this time. Greek and Roman sculptors and artists are believed to have used African slaves as models, resulting in the negroid proportions of many early works of art. The egyptian carvings show elaborate emphasis on racila characteristics of face and head, with no attention given to the body. This assertion by White while not accompanied by data of any sort was an advance upon new ground and was to be of great value in the development of the study of anthropometry.

The next advance according to Wilder and Pfieffer was the use of living subjects, by ascertaining certain superficial landmarks, thus anthropometry of the living de-

veloped. These authors state that Bertillion in 1882 realized that body measurements could be used as identification of criminals and developed the system of "Bertillonage" based on 11 easily taken body measurements. By the first of the twentieth century the anthropometry of the living body became an active study. In 1912 the Fourteenth International Congress of Anthropometry and Archeology met at Geneva, Switzerland to standardize equipment and procedure so that various data might be compared.

Hrdlicka (1925) made a study of stature, of at least third generation Americans in the eastern part of the United States. He found that there was an increase of stature due to favorable changes of environment, so we can conclude that in sections of the United States, where no foreign born element is common, the size of the children would in all probability exceed those of foreign born. Yane (1938) gives a full description of the methods used in making the study now in progress, parts of which are used in this study.

O'Brien (1937) also gives some of the details. Early in the spring of 1937 the Bureau of Home Economics received an allotment under the Emergency Relief Act of 1936 to study body measurements of children needed for the proper

sizing of children's garments. Both Yane and O'Brien point out the fact that the present system of marking sizes is wasteful and unsatisfactory to all concerned from the manufacturer to the consumer.

O'Brien (1939), in the preliminary report of the co-operative study of body measurements, states that size 8 garments were found to be of a size that they might be worn by children ranging from 4 to 13 years of age. The statisticians working with the data found that height, weight, hip girth and chest girth were highly correlated with the other body measurements, and that age was least important as an indication of size. "Stature-hip-girth" probably constitutes a better index to garment sizing than age, since both can be easily determined at home with an ordinary tape line.

A number of authors have written on the subject of standards in clothing from the economic standpoint. Saum (1925) points out the economy to all concerned if garments were made to fit without the necessity of alterations. Standard sizes would result in better looking, longer wearing garments, which would probably increase the demand for such garments.

Nystrom (1928) says the origin of the present system of sizes has been an outgrowth of a trial and error method of procedure by retailers. He points out some of the problems of incorrect sizing. In the present system it takes too long to purchase garments of the proper fit, due to the fact they must be tried on. If alterations cannot be made there is a loss of sale or there is the problem of returned goods which in many cases must be marked down to be sold at all. With all these factors the merchant stands a chance of incurring the ill will of the customer which may result in a loss in the ultimate business of the firm.

Ohrbach (1937) gives information concerning sizes as a problem in the stores of New York City. He says there is no standard size. Trying on is the only solution to the problem at present.

Coles (1938) points to the fact that while sizes are given on ready-made goods of all kinds the lack of uniformity in these sizes make it difficult for the consumer to use this information except as approximate to size. Garment sizes vary with the manufacturer and style trends, so for that reason are not generally uniform. By elimination of the existing chaos in the garment industry one of the greatest problems confronting the retailer would be practically

solved as well as a saving in time and energy resulting to the consumer who is shopping.

Certain studies that deal with increment of growth of children are pertinent to this study. Baldwin (1921) studied the measurements of children at various age levels for the purpose of establishing a basis of physical and mental growth. Here again attempts are made to standardize equipment and methods by co-operation with such agencies as the United States Museum of Natural History and heads of college and university departments. A series of norms based on height-weight distributions were established and it was concluded that the mental development was paralleled by physical growth in normal children.

Whitacre (1939) studied body measurements of school children in San Antonio, Texas, schools. It was a study of white Mexican and Negro children ranging in age from 7 to 17 years. Growth and nutrition were compared and body studied in relation to body measurements of different ages. The measurements were, standing and sitting heights, shoulder and hip widths. It was found the Texas boys closely approximated the size and weight of the Dreyer's standard. Reports agreed with similar measurements made by the Public Health Service of four widely separated geo-

graphical sections of the United States, also the children of Houston, Texas , and varied only slightly with the children of Iowa City. While these findings were not of use in clothing comparison, they were of value in ascertaining that children of a given age vary little in body scale, in different sections of the United States.

There have been reported a number of studies of body measurements and measurements of patterns or of garments, for women and girls. Morgan (1931) made comparisons between body measurements of women and those of certain commercial patterns. She found great confusion resulting from deviations in size of commercial patterns that supposedly conform to standards. She concluded that further standards are needed in girth and width measurements of mature women.

LaFleur (1931) compared body measurements of college women with certain commercial patterns. She found the least variation in the size of the shoulder, the most marked deviation was in the waist and the hips. The pattern study indicated that patterns supposedly of the same size in various makes vary in actual measurements. Measurements on the envelope do not correspond to the pattern inside, certain measurement as shoulder and chest which should remain the same in all patterns of one size,

even though the style varies, are found to vary in the same commercial patterns.

Little (1928) made a comparative study of the measurements of commercial patterns and body measurements. She found that patterns did not agree with either the median or maximum physical measurements as to rate of increase in size. A wide variation in measurements of patterns of the same size and make, and those of various makes, was found to exist.

Jernberg (1932) made a comparison of the relation between certain body measurements of individuals and those shown on commercial patterns. She concluded that the slope of the shoulder of four commercial patterns was greater than the average established slope of the measured shoulder, that commercial patterns need further standardization, and that the price had no influence on the deviation from the average measurements of 100 college women.

Musgrave (1933) compared the relationship existing between body measurements of women. She measured a selected group of women and compared their measurements. She found little relationship between the length of the French dart line or the line of vertical depth of the armscye, nor between the drop of the front and back of the shoulder line.

The greatest relationship existed between circumferences of the upper arm and trunk measurements.

Johnston (1933) compared the body measurements of college women with corresponding measurements of commercially made garments. She concluded that the average physical and dress measurements varied in amount from one measurement to another and from one size to another. Very little relationship between the increase in each measurement of the commercially made dress from one size group to another was found. The human figure in most cases showed a definite rate of increase between the average measurements from one size group to another.

Jacobson (1933) related price to the similarity between the measurements of certain commercially made garments and the measurements of a selected group of women. Very little relationship was found between the increase in measurements of commercially made dresses from one size group to another. Price bore some relationship to garment proportions, that is, the highest price showed the most ample proportions.

Ulrich (1938) compared the body measurements of girls from 6 to 14 years with measurements of dresses in corresponding sizes. She concluded from her findings that

gradual growth increments were found to exist in the body measurements of dresses of the same size, and that a definite need for garment size standardization is shown.

METHOD OF PROCEDURE

The body measurements of a selected group of boys of the ages 6, 8, 10, 12, 13, and 14 years were secured from those taken in Kansas by the Bureau of Home Economics in 1938. Twenty-one measurements significant to the construction of shirts and trousers were selected for study. The measurements of 100 boys in each of the age groups mentioned were taken as samples. These data were tabulated, the arithmetric mean, median, standard deviation and standard error of the mean were calculated for each of the twenty-one measurements within each age group.

The equipment and methods of taking the measurements are described in Ulrich (1938) and Bureau of Home Economics publication, Manual of Measurements (1937).

Shirts and trousers of 10 different manufacturers were measured in the sizes corresponding to the age groups measured. The measurements decided upon were those considered to have direct bearing upon garment construction and related directly to the body measurements taken. The

relationship is recognized by a comparison of measurements taken on the garment and on the child.

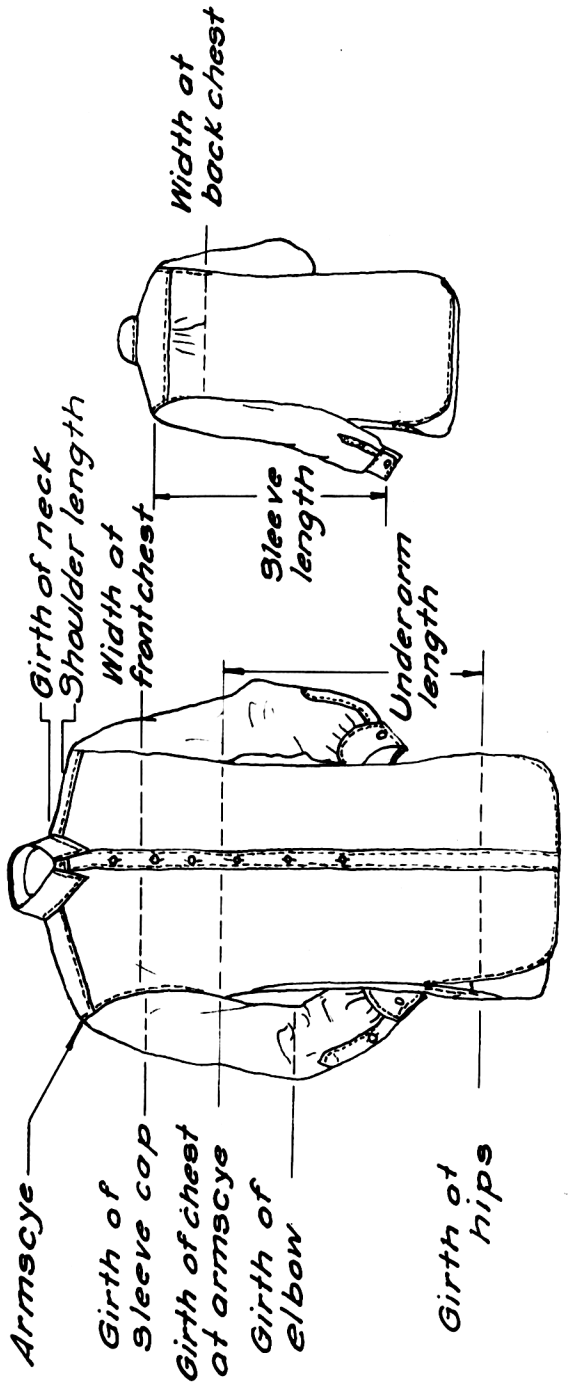
	Body Measurements	Shirt Measurements
1.	Girth of neck base	Neck girth
2.	Shoulder length	Shoulder length
3.	Girth of armscye	Armscye
4.	Width of anterior chest	Front chest, width
5.	" " posterior "	Back " "
6.	Length of trunk line ‡ waist to hip	Total underarm length
7.	Girth of chest at armscye	Girth of chest at scye line
8.	Anterior arc of chest	Front girth of chest at scye line
9.	Girth of arm at elbow	Girth of sleeve at elbow
10.	Length of arm	Length of sleeve
11.	Girth of upper arm at armscye	Girth of base of sleeve cap
12.	Girth of hips	Girth of hip line
13.	Slope of shoulder	Slope of shoulder
		Girth of cuff
		Trouser Measurements
14.	Girth of waist	Waist measurement
15.	" " hips	Hip girth
16.	" " thigh	Girth of thigh
17.	" " knee	" " knee
18.	Back arc of hips	Girth of hips, back
19.	Crotch length	Crotch length
20.	Height of waist from floor	Side length
21.	" " crotch " "	Inseam
22.	Extreme bend	Back length

All measurements were taken with Lufkin liner metric tape. To prevent distortion of the garments they were laid flat on a table. Lines were established and marked with pins and readings of the measurements were taken. Two readings were made to assure accuracy. Plates I and II

EXPLANATION OF PLATE I

Lines measured on the shirts.

Plate I


Width of back chest
Girth of neck
Shoulder length
Width of frontchest
Sleeve length
Underarm length
Armscye
Girth of sleeve cap
Girth of chest of armscye
Girth of elbow
Girth of hips

EXPLANATION OF PLATE II

Lines measured on the trousers.

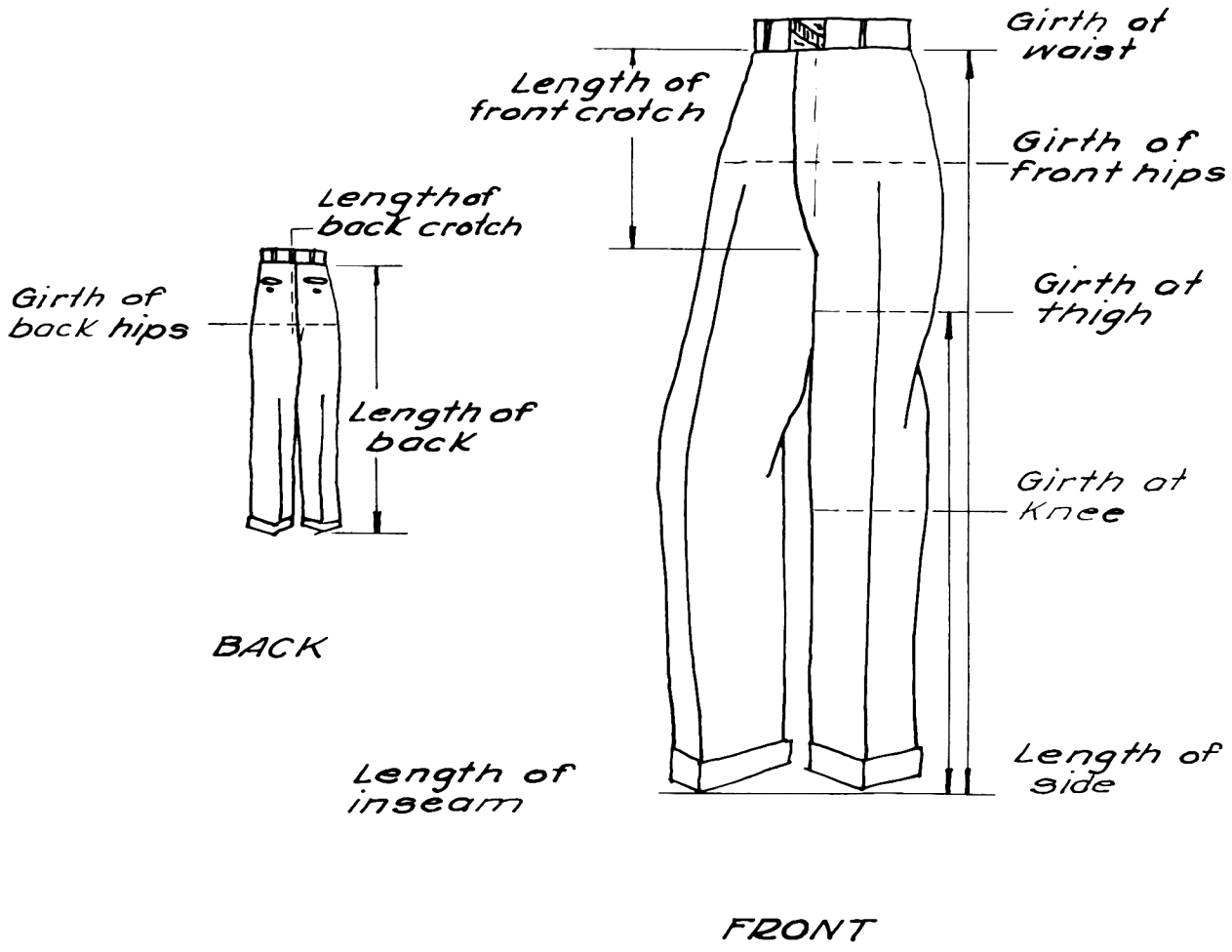

Length of front crotch
Girth of waist
Girth of front hips
Girth of thigh
Girth of knee
Length of side
Length of inseam
Length of back crotch
Girth of back hips
Length of back
BACK
FRONT

Plate II

represent the plan for measuring the garments. The exact procedure for each measurement is here given.

The shirts were completely buttoned and the end of the neck band pinned in place so it did not slip. The trousers also were buttoned and the end of the waist band pinned securely. When seams did not coincide, a point half-way between the stitchings was established and measurements taken from this point.

Shirts

No. 1. Neck girth. Measured at base of neck band completely around on the inside edge.

No. 2. Shoulder length. Yoke pinned with front and back edges touching. Measured along folded edge from neck band to extremity of shoulder.

No. 3. Armscye. Underarm seam marked with pin. Measured around on outer edge of seam, permitting the edge of the tape to touch the seam.

No. 4. Front chest width. Bisect front of armscye bisected, measured down on opposite armscye an equal distance from edge of yoke. Measured from outer extremity of armscye across the front of the shirt.

No. 5. Back chest width. Same procedure as for front.

No. 6. Underarm length. Measured from top of underarm seam to bottom of gusset, or to similar point as indicated in special note pertaining to garment.

No. 7. Girth of chest at armscye. Measured completely around garment at underarm line or the scyeline.

No. 8. Front girth of chest at armscye. Measured from underarm seam across the front of garment on line established in No. 7.

No. 9. Girth of sleeve at elbow. Elbow established halfway between top of cuff and the lowest point of the armscye curve. Measured entirely around the sleeve.

No. 10. Length of sleeve. Measured along top edge of sleeve from outer edge of armscye seam to extreme edge of cuff.

No. 11. Girth of base of sleeve cap. A line established on the sleeve which indicates the filling yarn that describes the greatest width of the sleeve and perpendicular to top fold of sleeve. Measure around on this line.

No. 12. Slope of shoulder. A line established perpendicular to the center front on the chest line. Measured from this line to highest point on shoulder which fell on the base of the neck; also measured from the chest line to a point at the extreme end of the shoulder line.

A drawing was made to reproduce the slope of the shoulder taking into account the length of the shoulder line and the distances from the chest line to the shoulder and from the chest line to the armscye. The angle formed by the shoulder line and the perpendicular erected from the chest line at the neck on the front of the garment was measured with a protractor. This angle was subtracted from a right angle to give the slope of the shoulder angle.

No. 13. Girth of hips. Measured around the garment at the extreme lower limit of underarm seams.

Girth of cuff. Measured at upper edge of cuff from button to outer edge of buttonhole, inside of cuff.

Trousers

No. 14. Girth of waist. Measured around the garment on the inside of lower edge of waist band.

No. 15. Girth of front hips. A point established two-thirds the distance down from the lower edge of waist band on the front crotch seam and mark with a pin. From this point, follow filling yarns across the front of the garment to the side seams. Measured the width of the garment on these lines.

No. 16. Girth of hips, back. Measured from seam line to seam line from points set up in No. 15 across the back of the garment.

No. 17. Girth of thigh. Measured around the leg of garment at the base of the crotch seam, following the filling of the material.

No. 18. Girth of knee. A line established halfway between crotch seam and bottom of garment measuring down the inseam. Measured straight around the leg at this point.

No. 19. Crotch length. Measured from lower edge of waist band in the front, along crotch seam to lower edge of waist back on the back.

No. 20. Side length. Measured from the lower edge of the waist band to extreme length of garment along the side seam.

No. 21. Inseam. Measured from the top of the crotch seam to extremity of garment on the inside leg seam.

No. 22. Length of back. Measured from highest point at the center back at base of waist band to extremity of the garment, following the warp of the material.

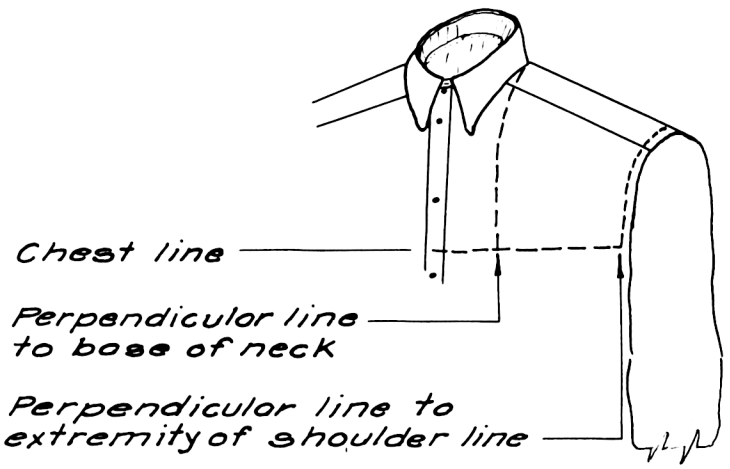


Fig. 1. Method used to measure the slope of the shoulder of shirts studied. Perpendicular lines were measured from the established chest line to the base of the neck and extremity of shoulder line. Fig. 2 shows calculation of angle of shoulder slope from measurements.

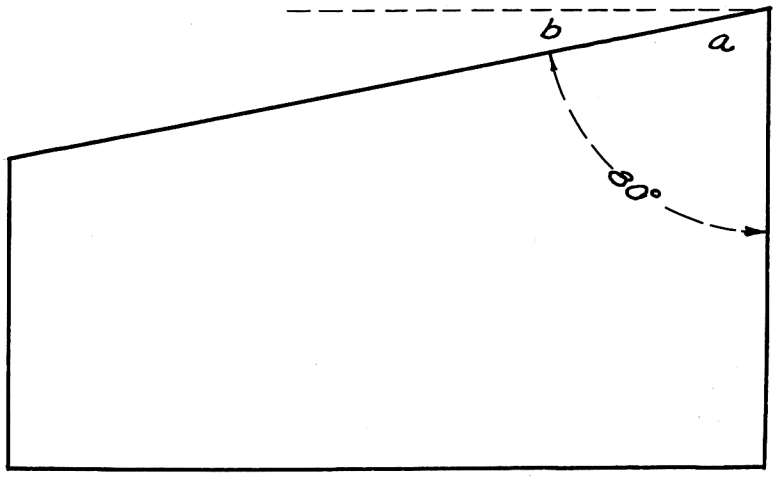


Fig. 2. The slope of the shoulder was reproduced taking into account the length of the shoulder line, and the distances from the established chest line to the base of the neck and the extremity of the shoulder line. Angle formed by the shoulder line and the perpendicular to the base of the neck was measured with a protractor. This angle was subtracted from a right angle (90°) to give angle b, the slope of the shoulder.

FINDINGS

Interpretation of data on body measurements necessitates the use of several statistical procedures. First, the individual scores must be grouped into classes. Garrett (1938) gives three main heads to this procedure. (1) Determination of the range or the difference between the smallest and largest scores. (2) Decision as to the size of the step or class intervals, that is the size of the groups to be used in the classification. (3) Tabulation of the separate scores within their proper step-intervals. This procedure is known as classification of measures or drawing up a frequency distribution.

Two measures of central tendency are used here. Garrett describes them as follows. The mean (M) is the best known measure of central tendency. It is defined as the sum of the separate scores or measures in a series divided by their number. Garrett's formula $M = AM + \left(\frac{fx'}{N}\right)i$ was used. AM equals the assumed mean, f, the frequency or the number of scores in each step interval, x', the deviation of the interval from the assumed mean and i the size of the step interval.

The median (Mdn) is the midscore or midpoint in the

series when ungrouped scores or other measures are arranged in order of size. In the formula used $Mdn = l + \left(\frac{\frac{N}{2} - F}{f_m}\right) i$, l equals the lower limit of the step interval, F, the sum of the scores below l, Fm the frequency within the step interval upon which the midscore falls. This measure is used when there are extreme cases which would effect the mean. The mean gives the extreme cases a chance to be of equal weight with the average cases, while the median eliminates them and gives the score denoting the central measurement.

Another measure used was the standard deviation (σ). This is, according to Garrett, the most reliable measure of varitability and is most often used in research. It is the square root of the mean of the squared deviations, taken from the arithmetic mean of the distribution. The following formula $\sigma = \left[\sqrt{\frac{fx'}{N} - \left(\frac{fx'}{N}\right)^2}\right] i$, is best suited for the purpose of finding the standard deviation with these data.

A measure of reliability is also used, the standard error of the mean (σ_M). The reliability of the mean depends upon having drawn a representative sample from the universe. The standard error of the mean measures the

extent to which the mean is affected by errors of measurement as well as by the fluctuation which arises from sampling. The formula $\sigma_M = \frac{\sigma}{\sqrt{N}}$ was used. Frequency distributions were made and the four measures, mean, median, standard deviation and standard error of the mean, calculated so that a statistical picture might be presented.

A Comparison of Body Measurements

The mean and median measurements of the 100 boys selected in each age group were similar or closely related indicating a homogenious group. The standard deviations on the whole were small, ranging from .81 to 7.94 centimeters. Since the mean score of each measurement plus or minus one standard deviation includes two-thirds of the cases it can be assumed that there was very little variation in the group. There was a tendency to have the cases closely grouped about the mean. The standard error of the mean tests the reliability of the sampling as well as the reliability of the mean. If a represenative sample from the universe which we are studying has been drawn the reliability of the mean can be measured by its standard error, or in other words the standard error of the mean measures the extent to which the mean is effected by errors

of measurement. A decrease in the standard error of the mean shows that the probable divergence of the obtained mean from the true mean of the entire population is rather small, hence, the reliability of an obtained mean increases as the standard error of the mean decreases. Due to the smallness of the standard error of the mean, ranging from .08 to .80 centimeters it can safely be assumed that the measurements are accurate.

The calculated mean, median, standard deviation and standard error of the mean of each of the selected body measurements for boys of the following age groups 6, 8, 10, 12, 13 and 14 years are shown in Table 1.

The increase in the measurements throughout reaffirms the statements made by Baldwin (1921) Little (1928) and Ulrich (1938) that growth for children from 6 to 14 years is gradual. The greatest increment of growth seemed to be found in the periods between the tenth and twelfth and the twelfth and fourteenth years. A period of retardation during the eighth to tenth years precedes the period of greatest growth, proving Baldwin's theory (1921) that the period of retardation before adolescence is usually accompanied by a period of rapid growth during adolescence. Apparently the greatest growth had been reached by the

Table 1. Twenty-one body measurements in centimeters of 100 boys in each of the following age groups: 6, 8, 10, 12, 13 and 14 years.

Age yrs.	Neck Girth				Shoulder Length				Armscye Girth				Anterior Chest Width				Posterior Chest Width			
	M[1]	Mdn[2]	σ [3]	σ_M[4]	M	Mdn	σ	σ_M	M	Mdn	σ	σ_M	M	Mdn	σ	σ_M	M	Mdn	σ	σ_M
6	29.31	29.35	1.47	.15	7.77	7.81	.81	.080	27.23	27.18	1.57	.16	21.18	21.25	1.41	.14	25.75	25.98	1.21	.12
8	32.40	31.30	1.59	.16	8.55	8.57	.82	.080	29.87	29.81	1.82	.18	23.25	23.14	1.49	.15	27.13	27.00	1.81	.18
10	33.06	33.12	1.53	.15	9.25	9.27	.81	.080	31.88	31.79	1.90	.19	24.70	24.55	1.67	.17	28.69	28.54	2.04	.20
12	34.26	34.15	1.52	.15	9.81	9.83	.86	.086	34.87	34.31	2.60	.26	26.93	26.45	2.01	.20	30.29	30.70	2.24	.22
13	35.15	34.95	2.05	.21	10.39	10.33	1.14	.110	36.39	36.20	2.71	.27	27.88	28.13	2.18	.22	31.65	31.42	2.81	.28
14	36.33	36.14	2.43	.24	10.62	10.53	1.05	.100	37.86	37.95	2.92	.29	29.03	28.65	2.44	.24	32.30	32.37	2.80	.28

1. Mean
2. Median
3. Standard deviation
4. Standard error of mean

Table 1. (cont.)

Trunk ↓ Waist to Hip				Chest Girth at Armscye				Anterior Arc of Chest				Girth of Arm at Elbow				Arm Length			
M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM
28.76	28.75	2.11	.21	60.65	60.60	2.76	.28	31.24	31.34	2.06	.20	19.73	19.62	1.38	.14	41.42	41.58	2.38	.24
31.06	30.92	2.12	.21	64.89	64.55	3.26	.32	34.19	33.89	2.47	.25	21.15	21.14	1.68	.17	46.02	46.16	2.31	.23
32.87	32.95	2.33	.23	68.67	68.59	3.56	.36	36.12	36.25	2.28	.23	22.38	22.48	1.46	.15	49.97	49.87	2.98	.30
35.47	35.35	2.62	.26	73.83	73.95	4.96	.50	39.86	39.66	2.95	.30	24.57	24.39	1.98	.20	54.55	54.23	3.40	.34
37.13	36.65	2.65	.27	77.33	76.95	5.44	.54	41.74	42.50	3.35	.34	25.46	25.49	1.86	.19	56.46	56.18	3.63	.36
38.16	37.87	2.95	.29	79.33	78.95	6.16	.60	43.17	43.05	3.84	.38	26.30	26.15	1.98	.20	58.67	58.55	3.48	.35

Table 1. (cont.)

Girth of Upper Arm at Armscye				Slope of Shoulder in Degrees°				Girth of Hips				Girth of Waist				Back Arc of Hips			
M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM
18.04	18.03	1.23	.12	25.85	25.86	3.95	.40	60.27	60.55	3.67	.37	53.79	53.53	3.10	.31	39.35	29.34	2.00	.20
19.55	19.82	1.41	.14	24.22	24.87	3.75	.38	65.29	65.01	4.26	.43	56.81	56.33	3.54	.35	31.88	31.58	2.69	.27
20.77	20.81	1.64	.16	24.92	24.95	3.20	.32	70.03	69.85	4.62	.46	58.97	58.41	3.72	.37	34.23	34.15	2.92	.29
22.72	22.45	2.43	.24	24.75	24.65	3.64	.37	75.69	75.65	6.40	.64	62.31	61.60	5.26	.52	37.79	37.61	4.08	.40
23.85	23.75	2.30	.23	24.91	24.23	4.02	.40	79.87	79.45	5.98	.60	64.49	64.14	4.44	.44	39.70	39.49	3.56	.36
24.26	23.95	2.45	.25	24.61	25.03	3.68	.37	82.47	82.21	6.68	.67	66.09	65.95	5.42	.54	40.71	40.41	4.66	.47

Table 1. (cont.)

Girth of Thigh				Girth of Knee				Crotch Length				Height of Waist from floor				Height of Crotch from floor				Extreme Bend from floor			
M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM	M	Mdn	σ	σM
33.95	33.82	2.44	.24	25.19	25.22	3.01	.30	49.36	48.95	3.16	.32	71.41	71.24	3.66	.37	51.37	51.25	3.16	.32	80.38	80.59	4.26	.43
37.13	36.19	3.20	.32	27.40	27.35	1.72	.17	52.81	52.87	3.14	.31	80.31	80.39	4.74	.47	58.23	58.03	2.94	.29	89.87	90.27	5.72	.57
39.75	39.45	3.54	.35	29.38	29.27	1.80	.18	56.69	56.55	3.46	.35	87.07	87.35	4.62	.46	63.57	63.27	3.84	.38	96.71	97.41	5.56	.56
43.93	43.41	4.86	.49	32.11	31.75	2.68	.27	61.25	60.67	4.88	.49	95.11	94.95	5.34	.53	69.95	70.01	4.32	.43	105.87	105.77	5.66	.57
45.67	45.45	4.08	.40	33.36	33.00	4.88	.49	63.37	62.55	4.88	.49	98.53	98.07	6.22	.62	72.81	72.73	4.58	.46	109.87	109.15	7.40	.74
46.77	46.31	4.40	.44	33.99	33.85	2.60	.26	65.65	64.81	5.06	.50	102.01	101.95	5.06	.50	75.29	75.31	4.28	.43	113.07	112.79	7.94	.80

thirteenth year for the group of boys studied, as the measurements in the fourteenth year show a marked retardation. The measurements indicate a gradual growth in all parts of the body where measurements were taken throughout the eight years studied.

The least growth was recorded in chest growth, trunk line, girth of arms, waist and hips and crotch length, showing less development of the trunk and arms, while the most growth was found in height of waist and height of crotch from floor and the general development of the legs. There was a marked development of neck and change in slope of shoulders. The slope of the shoulder became less, showing a squaring of the shoulders of boys from 6 to 14 years.

In the case of the measurements showing greatest growth, there seemed to be a tendency to show a greater dispersion from the mean as shown by the larger standard deviations. This indicates that these measurements were less reliable as measurements of age size than some of the other less variable body measurements. The increment of growth from one age to the next based upon the body measurements of 100 boys of each age group, 6, 8, 10, 12, 13 and 14 years is shown in Table 2.

Table 2. Increment of growth from one age to another based upon the body measurements in centimeters of 100 boys in each of the following age groups: 6, 8, 10, 12, 13 and 14.

Age yrs.	Neck girth	Shoulder length	Armscye girth	Chest width ant.	Chest width post.	Trunk	Chest girth at armscye	Chest arc ant.	Arm girth at elbow	Arm length
6-8	3.09	.78	2.64	2.07	1.38	1.30	4.24	2.95	1.43	4.60
8-10	.66	.70	2.01	1.45	1.56	1.81	3.78	1.93	1.23	3.95
10-12	1.20	.56	2.99	2.23	1.60	2.60	5.16	3.74	2.19	4.68
12-13	.79	.38	1.89	.95	1.36	1.66	3.50	1.88	.89	1.91
13-14	1.18	.23	1.75	1.15	.65	1.03	2.00	1.43	.94	2.21

Table 2. (cont.)

Upper arm girth at armscye	Shoulder slope°	Hip girth	Waist girth	Hip arc back	Thigh girth	Knee girth	Crotch length	Waist ht. from floor	Crotch ht. from floor	Extreme bend
1.51	-.60	5.02	3.02	2.53	3.18	2.21	3.45	8.90	6.86	9.50
1.22	-.33	4.74	2.16	2.35	2.65	1.98	3.88	6.76	5.34	6.84
1.95	-.17	5.66	3.34	3.56	4.18	2.73	4.56	6.04	6.38	9.16
1.13	+.16	4.18	2.18	1.91	1.74	1.25	2.12	3.32	2.86	4.00
.41	-.30	2.60	1.60	1.01	1.10	.63	2.28	3.48	2.48	3.20

A Comparison of Measurements of Commercially Made Shirts

The garments selected for study were shirts and trousers of regulation style current at the time. The regular sizes of boys' shirts were 6, 8, 10, 12, 12½, 13, 13½ and 14, and in some brands continuing in even sizes to 18. Most lines stop at size 14½. Trousers were found to be available in sizes 4, 6, 8, 10, 12, 14 and 16, and in some brands 18 was included. The stores rarely stock size 4 and it was difficult to find size 6 in some brands. The sizes are supposed to correspond to same age among boys, so that a 6 year old boy should be able to wear size 6 shirts and trousers. The garments were measured in three Manhattan stores that handle boys' clothing.

The garments measured in this study were all the available sizes between the range of 6 and 14, since only the measurements of boys between the corresponding ages were available. The shirts measured were priced from $0.35 to $0.95 each. Shirts of similar price usually corresponded in quality. In most cases the same type of garment was found in each of the three stores. Thrift Quality selling for $0.35, Super Oxhide, $0.39 and Red Cap, $0.39, all were made of blue chambry of a similar quality

and workmanship. The hems were better in Thrift Quality and Super Oxhide; Red Cap had no gusset at the side hem line and had over casting in place of a hem. The buttons, however, were better on Red Cap than on the other two brands.

J. C. P. selling for $0.49, Honor Bright, $0.49 and M & W, $0.49 were dress shirts of rather poor material, much starch was present and all three brands showed a tendency to be cut carelessly. The workmanship was universally poor in this class, but no one brand seemed to be worse or better than the other.

Penrod selling for $0.79 and True Blue, $0.79 were both dress shirts of good quality material and good construction. The materials were Sanforized and guaranteed fast color. The cut of the garments was good.

Tom Sawyer, $0.98 and Top Flight, $0.98 were the best dress shirts measured. They were of good material, well made, guaranteed fast color and Sanforized. Top Flight had the permanent stiffening in cuffs and collars found in the better grade of shirts for adults.

The shirts found in the stores that furnish specifications and measurements for the manufacture of their garments, seem to have the most consistent size range. (See Table 3 noting brands labeled, Super Oxhide, J. C. P.,

M & W, and Top Flight). The measurements of the shirts of the ten different manufacturers are given in Table 3.

A Comparison of Measurements of Commercially Made Trousers

The trousers measured were priced from $0.89 to $2.98. Industrial Uniform Pants, $0.89, K T Togs, $0.98 and Play Pants, $0.98, were all of denim or drill and all were well made. The quality of material and workmanship seemed to be uniform in this class of garments. Scotts' Best, $0.98 and Dress Pants, $0.98 were wash dress trousers, well made but of inferior material. Doeskin, $1.49, Keen Boy, $1.29 to $1.98, and Man-O'-Fashion, $1.98, corresponded in quality of material, were well made and were constructed of wash materials, cotton twill, crash, and gaberdine. There was a wide price range, however, in one brand, the price apparently based upon the amount of material needed to construct the garment. One class of Corduroys and one of wool was measured. These two corresponded more nearly in price than in quality. The "cords" were uniform in workmanship and of good quality, while the woolens were widely different in material and workmanship though made by the same manufacturers.

Table 3. Fourteen measurements in centimeters of the 10 groups of ready-made shirts studied.

Trade name	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest: girth	Elbow: girth	Arm length	Arm girth at armscye	Shoulder slope°	Hip girth	Cuff girth
Thrift Quality														
Size 6	29	9	36	30	31	24	40	80	28	40	34	20	80	17
" 8	30	9	37	30	32	24	40	80	29	42	34	20	80	18
" 10	32	10	38	33	34	27	42	87	30	44	36	19	86	19
" 12	33	10	39	34	35	25	43	87	30	46	35	19	86	19
" 12½	34	11	43	36	38	30	47	94	32	51	40	17	90	19
" 13	35	12	45	36	39	30	48	96	34	53	44	16	94	20
" 13½	36	12	45	37	40	29	48	97	34	58	46	16	98	21
" 14	37	13	50	38	42	30	50	100	36	61	48	16	100	21
Super Oxhide														
Size 6	30	9	42	27	30	28	39	78	30	41	34	13	67	20
" 8	31	10	42	32	34	28	41	82	30	42	36	15	79	21
" 10	32	11	44	34	36	28	43	87	33	42	38	17	88	21
" 12	33	12	44	35	37	32	44	89	34	45	38	19	88	21
" 12½	35	12	46	35	40	34	48	96	35	50	41	19	96	24
" 13	36	13	48	35	40	35	48	98	35	54	42	14	96	23
" 13½	37	14	51	37	42	37	52	107	35	58	44	15	104	24
" 14	38	14	50	38	42	40	54	108	36	58	46	15	104	21
Red Cap														
Size 6	30	9	42	27	29	26	38	78	32	40	38	18	76	22
" 8	31	11	44	30	32	32	42	84	32	42	40	15	82	22
" 10	30	11	42	30	34	24	40	82	28	43	38	15	82	21
" 12	32	12	46	34	36	34	45	95	30	47	40	14	84	22
" 12½	34	12	46	38	39	40	49	98	36	51	40	14	86	22
" 13	36	13	46	40	40	42	49	98	36	52	42	16	94	24
" 13½	38	14	48	41	43	45	52	104	38	55	45	13	104	24
" 14	39	15	49	43	45	46	55	110	39	55	44	17	108	24

Table 3. (cont.)

Trade name	Neck girth	Shoulder length	Arms-cye	Chest front	Chest back	Under-arm length	Chest girth at armscye front	Chest girth	Elbow girth	Arm length	Arm girth at armscye	Shoulder slope°	Hip girth	Cuff girth
J. C. P.														
Size 6	30	9	34	29	31	26	36	73	26	40	28	20	74	19
" 8	32	11	36	31	33	28	39	78	28	41	32	15	76	20
" 10	33	12	38	32	35	30	41	83	30	44	34	15	82	20
" 12	34	12	42	34	37	35	44	90	30	48	36	16	86	21
" 12½	35	13	46	35	38	35	45	91	34	51	40	15	88	21
" 13	36	13	50	38	40	35	48	96	36	53	46	15	92	22
" 13½	37	13	50	39	42	37	48	98	37	55	48	15	96	23
" 14	38	14	51	40	42	38	50	100	38	58	48	15	100	23
Honor Bright														
Size 6	30	10	36	28	30	26	36	69	27	40	30	20	76	17
" 8	31	10	37	28	31	26	38	70	28	41	32	20	78	18
" 10	33	10	39	30	31	27	40	80	30	45	34	20	80	19
" 12	34	10	42	31	33	29	42	86	31	49	38	25	86	19
" 12½	35	11	41	31	34	28	41	85	30	49	36	20	87	20
" 13	35	12	48	36	38	35	46	95	36	53	44	15	96	21
" 13½	37	13	49	37	40	37	49	97	37	55	46	18	98	20
" 14	37	14	50	38	43	39	51	103	38	59	48	11	100	21
M & W														
Size 6	30	10	32	30	30	26	39	78	27	39	30	19	76	17
" 8	31	10	34	30	31	24	40	80	27	42	32	18	80	20
" 10	32	11	38	33	34	27	43	86	30	47	36	16	86	20
" 12	34	11	39	34	36	29	44	89	29	51	37	16	90	20
" 12½	35	12	42	35	36	31	45	90	29	53	38	15	90	20
" 13	36	13	44	36	38	34	46	92	32	55	40	16	92	20
" 13½	37	14	48	38	40	35	48	96	34	59	42	16	94	22
" 14	38	14	48	40	41	36	50	100	36	61	44	17	100	22

Table 3. (cont.)

Trade name	Neck girth	Shoulder length	Arms-cye	Chest front	Chest back	Under-arm length	Chest girth at armscye front	Chest girth	Elbow girth	Arm length	Arm girth at armscye	Shoulder slope°	Hip girth	Cuff girth
Penrod														
Size 6	29	10	32	30	34	32	38	80	28	44	29	20	78	18
" 8	30	10	35	31	36	34	39	82	30	46	30	18	80	18
" 10	32	11	39	31	37	35	41	85	30	46	37	20	85	20
" 12	34	12	39	36	39	30	45	91	31	49	35	15	88	20
" 12½	33	12	46	33	38	35	46	91	34	52	44	15	94	20
" 13	35	13	50	36	40	37	49	98	36	52	46	14	100	20
" 13½	36	15	52	38	44	39	51	104	35	59	44	18	103	21
" 14	36	16	52	41	46	39	54	110	38	61	46	19	108	21
True Blue														
Size 6	30	9	33	27	30	33	42	84	27	41	29	18	79	18
" 8	32	10	34	30	34	34	42	84	28	42	30	18	80	20
" 10	33	11	40	32	35	34	43	88	32	49	34	16	88	20
" 12	34	11	42	33	38	35	44	89	32	51	38	16	91	20
" 12½	35	13	46	35	39	36	47	95	34	54	40	20	92	21
" 13	36	13	50	36	40	37	49	99	36	55	47	19	100	21
" 13½	37	13	54	37	41	40	51	102	36	56	48	15	102	21
" 14	39	14	56	38	43	42	52	104	39	60	49	14	104	22
Tom Sawyer														
Size 6	28	13	30	31	35	34	38	80	27	40	28	18	80	19
" 8	30	13	32	33	36	35	40	82	28	41	30	10	81	19
" 10	32	14	36	35	38	34	44	88	30	45	32	11	85	19
" 12	34	15	40	36	41	36	46	93	34	49	36	14	90	19
" 12½	36	15	46	34	40	36	46	93	34	55	41	18	90	20
" 13	35	15	48	37	42	40	49	95	35	58	43	19	96	21
" 13½	35	17	49	38	46	39	51	97	36	59	44	15	102	21
" 14	36	18	48	40	47	42	53	106	38	61	44	14	108	22
Top Flight														
Size 6	30	9	34	28	34	32	40	82	30	40	36	20	80	19
" 8	32	9	36	30	36	34	41	84	30	42	37	20	82	19
" 10	33	11	38	32	36	36	43	88	30	46	36	15	86	21
" 12	34	11	42	33	39	38	47	96	33	52	40	15	92	21
" 12½	35	12	44	34	39	38	47	96	34	53	40	15	96	21
" 13	36	13	44	35	42	40	51	102	36	56	44	14	100	22
" 13½	37	13	50	36	42	42	51	102	36	57	46	14	104	23
" 14	38	14	52	38	45	44	53	106	38	61	48	15	106	24

Here as with shirts, we find the trousers for sale by firms furnishing specifications and measurements for the manufacture of their garments, more consistent in size (See Table 4 noting brands labeled, Industrial Uniform, Keen Boy and Man-O'-Fashion). Greater variations were found between the measurements of garments of the same size produced by the various manufacturers than between the successive sizes produced by one manufacturer.

The measurements of trousers of the ten different manufacturers are given in Table 4.

The mean and standard deviation of the garments measured were calculated. This was done by the ungrouped method, since ten is too low a number to use a frequency distribution. The formulae (Garrett, 1938), $M = \frac{\Sigma X}{N}$ was used for calculation of the mean, and $\sigma = \sqrt{\frac{\Sigma X'^2}{N} - M'^2}$ was used for the standard deviation.

Tables 5 and 6 show the mean and standard deviation of measurements in centimeters of the 10 different makes of shirts and trousers.

Analysis of the data indicates the extent to which uniformity exists in the sizes of ready-made shirts and

Table 4. Nine measurements in centimeters of the 10 groups of ready-made trousers studied.

Trade name	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Ind. Uniform									
Size 6	64	90	52	54	44	48	74	55	80
" 8	68	94	54	56	46	59	79	57	84
" 10	69	96	56	58	48	63	86	62	90
" 12	72	100	57	59	50	65	91	67	96
" 14	75	104	60	62	52	68	97	72	102
K T Togs									
Size 6	61	81	46	56	45	62	72	51	75
" 8	63	96	50	60	47	65	78	56	81
" 10	67	100	52	62	48	69	89	65	92
" 12	73	104	53	65	50	73	98	71	101
" 14	73	110	56	66	52	76	102	73	117
Play Pants									
Size 6	63	88	48	54	46	59	73	52	77
" 8	64	98	54	56	47	64	80	56	83
" 10	68	100	56	58	48	67	86	61	88
" 12	70	102	58	60	49	68	93	67	97
" 14	72	104	60	64	50	72	102	75	104
Scotts Best									
Size 6	64	89	48	54	45	62	86	60	90
" 8	65	90	50	56	46	64	87	64	92
" 10	67	91	52	60	49	68	89	64	93
" 12	71	94	52	60	50	69	100	73	105
" 14	73	93	47	64	52	72	111	84	115
Dress Pants									
Size 6	62	88	50	45	43	62	69	48	73
" 8	66	96	54	58	46	64	80	59	84
" 10	67	100	56	60	57	66	87	64	92
" 12	70	101	57	61	58	71	94	68	98
" 14	70	102	58	61	58	72	101	74	104

Table 4 (cont.)

Trade name	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Cords									
Size 6	60	88	48	52	42	61	67	45	70
" 8	65	94	50	56	44	64	82	59	85
" 10	66	96	52	59	46	67	88	64	92
" 12	68	99	53	61	48	71	93	68	97
" 14	70	102	55	64	52	73	100	75	105
Doeskin									
Size 6	67	96	52	56	46	54	72	54	74
" 8	68	97	54	59	48	56	76	56	79
" 10	69	99	55	60	50	61	83	61	87
" 12	72	100	56	62	50	63	95	70	99
" 14	74	107	58	64	54	65	101	75	104
Keen Boy									
Size 6	60	91	50	56	48	61	83	61	86
" 8	62	93	52	58	49	63	85	62	88
" 10	64	94	52	60	51	67	89	65	94
" 12	68	96	54	62	53	68	95	69	99
" 14	72	98	56	64	56	71	101	75	105
Man-O-Fashion									
Size 6	62	94	50	58	46	63	80	58	84
" 8	64	96	52	60	49	65	82	60	86
" 10	68	100	54	61	50	67	89	64	95
" 12	69	104	56	62	52	70	96	70	100
" 14	71	108	58	64	54	72	100	75	104
Tom Sawyer									
Size 6	59	80	40	45	40	58	81	45	86
" 8	60	84	42	46	45	64	82	60	87
" 10	61	95	52	60	48	66	90	65	93
" 12	63	98	53	64	50	69	94	70	99
" 14	70	104	56	64	52	72	98	73	104

Table 5. The mean and the standard deviation of measurements in centermeters of 10 different makes of shirts in sizes, 6, 8, 10, 12, 12½, 13, 13½ and 14 years.

Size	Neck girth		Shoulder length		Armscye		Chest front		Chest back		Underarm length		Chest girth at armscye front		Chest girth		Elbow girth		Arm length		Arm girth at armscye		Shoulder slope°		Hip girth		Cuff girth	
	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ
6	29.60	1.39	9.65	1.16	35.20	4.0	28.55	1.4	31.40	2.02	28.70	4.6	38.6	2.4	78.2	3.7	28.2	1.70	40.50	1.3	31.6	3.30	18.6	2.07	76.6	3.7	18.5	1.40
8	31.00	.20	10.25	1.09	36.70	3.4	30.50	1.3	33.50	1.90	29.85	4.1	40.2	1.5	80.7	2.3	29.0	1.40	42.05	1.2	33.3	3.20	16.9	3.01	79.8	1.7	19.4	1.20
10	32.20	.20	11.20	1.09	39.20	2.3	32.15	1.6	34.95	1.70	30.20	1.3	42.0	1.3	85.4	4.0	30.3	1.10	45.10	1.9	35.6	2.00	16.3	2.70	84.8	2.5	20.0	.24
12	33.60	1.20	11.60	1.30	41.50	2.1	33.95	1.4	37.10	2.10	32.30	3.3	44.4	1.3	90.5	2.7	31.4	1.90	48.65	2.1	37.3	1.70	16.9	2.40	88.1	2.4	20.2	1.00
12½	34.35	1.04	12.25	1.10	44.55	1.8	34.55	1.7	38.10	1.70	34.30	3.4	46.1	3.0	92.9	1.7	33.3	2.14	51.85	1.7	40.0	1.90	16.8	2.10	91.9	3.0	20.8	1.30
13	35.60	.40	13.00	.20	46.80	2.1	36.20	1.3	39.85	2.30	36.50	3.3	48.3	1.4	96.9	2.5	35.2	1.10	54.10	1.8	43.8	2.04	15.7	1.30	96.0	2.8	21.3	1.30
13½	36.70	1.40	13.75	1.30	49.60	2.3	37.75	1.3	41.95	1.80	39.00	3.1	50.1	1.5	100.4	3.5	35.8	1.20	57.10	1.6	45.3	1.70	15.5	1.02	100.5	3.4	22.0	1.70
14	37.60	1.05	14.40	1.05	50.60	2.2	39.40	1.6	43.60	1.90	39.60	4.0	52.2	1.7	104.7	3.7	37.7	1.00	59.50	1.9	46.5	1.90	12.2	2.00	103.8	3.3	22.0	1.10

Table 6. The mean and the standard deviation of measurements in centimeters of 10 different makes of trousers in sizes 6, 8, 10, 12 and 14 years.

Size	Waist girth		Hip girth		Hip width back		Thigh girth		Knee girth		Crotch length		Side length		Inseam		Back length	
	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ	M	σ
6	62.20	2.70	88.5	4.69	48.40	3.33	52.95	4.24	44.50	1.60	58.95	3.19	75.70	5.47	52.80	2.80	79.45	6.25
8	64.40	2.40	93.7	4.12	51.25	3.35	56.45	2.60	46.70	2.12	62.90	2.40	81.00	3.00	58.80	2.50	84.74	3.47
10	66.50	2.48	97.3	2.28	53.60	2.24	59.85	1.30	49.40	2.90	66.00	2.19	87.45	2.00	63.25	1.58	91.35	1.97
12	69.50	2.76	99.7	3.20	54.80	2.00	61.60	1.72	50.95	2.70	68.60	2.66	95.55	1.90	69.10	1.70	99.60	2.40
14	71.85	1.62	103.1	1.70	56.30	4.70	63.70	1.26	53.20	2.90	71.20	2.77	101.00	3.50	75.65	1.80	106.35	5.80

trousers. An increase in the measurements from one size to the next was generally noted within the produce of one manufacturer. However, the measurements did not show a consistent increase from one size to the next. Greater variations were found between the measurements of trousers produced by various manufacturers than between shirts.

Shirts in sizes 12 to 14 run in half sizes, therefore, very little increase in size was expected. The principal variations seem to occur in the measurements of neck band and sleeve length.

The increments of measurements from one size garment to the next, based upon mean measurements is shown in Tables 7 and 8.

Tables 9 and 10 show the average body measurements as calculated, compared with the actual measurements of garments in the corresponding range of sizes studied in the ten brands produced by different manufacturers.

Table 7. Increment of measurements of shirts from one size garment to another based on mean measurements in centimeters of the product of 10 manufacturers in each size, 6, 8, 10, 12, 12½, 13, 13½ and 14 years.

Sizes	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest girth	Elbow girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
6-8	1.40	.60	1.50	1.95	2.10	1.15	1.6	2.5	.8	1.55	1.7	-1.7	3.2	.9
8-10	1.20	.95	2.50	1.65	1.45	.35	1.8	4.7	1.3	3.05	2.3	-.6	5.0	.6
10-12	1.40	.40	2.30	1.80	2.15	2.10	2.2	5.1	1.1	3.55	1.7	+.6	3.3	.2
12-12½	.70	.65	3.05	.60	1.00	2.00	1.7	2.4	1.9	3.20	2.7	+.1	3.8	.6
12½-13	1.25	.75	2.25	1.65	1.75	2.20	2.2	4.0	1.9	2.25	3.8	-.9	4.1	.5
13-13½	1.10	.75	2.80	1.55	2.10	3.50	1.8	3.5	.6	3.00	1.5	-.2	4.5	.7
13½-14	.90	.65	1.00	1.65	1.65	.60	2.1	4.3	1.9	2.4	1.2	-.3	3.3	.0

Table 8. Increment of measurements of trousers from one size garment to another based on mean measurements in centimeters of the product of 10 manufacturers in each size, 6, 8, 10, 12 and 14 years.

Sizes	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
6-8	2.20	5.2	2.85	3.50	2.20	3.95	5.30	6.00	5.29
8-10	2.10	3.6	2.35	3.40	2.70	3.10	6.45	4.45	6.61
10-12	3.00	2.4	1.20	1.75	1.45	2.60	8.10	5.85	8.25
12-14	2.35	4.4	1.50	2.10	2.35	2.60	5.45	6.55	6.78

Table 9. A comparison in centimeters of the mean body measurements for a certain age with the garment measurements of shirts in the corresponding size.

	Neck girth	Shoulder length	Arms-cye	Chest front	Chest back	Under-arm length	Chest girth at armscye front	Chest girth	Elbow girth	Arm length	Arm girth at armscye	Shoulder slope°	Hip girth	Cuff girth
Body meas. age 6	29.31	7.77	27.23	21.48	25.75	28.76	31.24	60.6	19.73	41.42	18.04	25.85	60.27	
Size 6														
Thrift Quality	29	9	36	30	31	24	40	80	28	40	34	20	80	17
Super Oxhide	30	9	43	27	30	28	39	78	30	41	34	13	67	20
Red Cap	30	9	42	27	29	26	38	78	32	40	38	18	76	22
J. C. P.	30	9	34	29	31	26	36	73	26	40	28	20	74	19
Honor Bright	30	10	36	28	30	26	36	69	27	40	30	20	76	17
M & W	30	10	32	30	30	26	39	78	27	39	30	19	76	17
Penrod	29	10	32	30	34	32	38	80	28	44	29	20	78	18
True Blue	30	9	33	27	30	33	42	84	27	41	29	18	79	18
Tom Sawyer	28	13	30	31	35	34	38	80	27	40	28	18	80	19
Top Flight	30	9	34	28	34	32	40	82	30	40	36	20	80	19
Body meas. age 8	32.24	8.55	29.87	23.25	27.13	31.06	34.19	64.55	21.15	46.02	19.55	25.25	65.29	
Size 8														
Thrift Quality	30	9	37	30	32	24	40	80	29	42	34	20	80	18
Super Oxhide	31	10	42	32	34	28	41	82	30	42	36	15	79	21
Red Cap	31	11	44	30	32	32	42	84	32	42	40	15	82	22
J. C. P.	32	11	36	31	33	28	39	79	28	41	32	15	76	20
Honor Bright	31	10	37	28	31	26	38	70	28	41	32	20	78	18
M & W	31	10	34	30	31	24	40	80	27	42	32	18	80	20
Penrod	30	10	35	31	36	34	39	82	30	46	30	18	80	18
True Blue	32	10	34	30	34	34	42	84	28	42	30	18	80	20
Tom Sawyer	30	13	32	33	36	35	40	82	28	41	30	10	81	19
Top Flight	32	9	36	30	36	34	41	84	30	42	37	20	82	19

Table 9. (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest: girth	Elbow: girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Body meas. age 10	33.06	9.25	31.88	24.7	28.69	32.87	36.12	68.67	22.38	49.97	20.77	24.92	70.03	
Size 10														
Thrift Quality	32	10	38	33	34	27	42	87	30	44	36	19	86	19
Super Oxhide	32	11	44	34	36	28	43	87	33	42	39	17	88	21
Red Cap	30	11	42	30	34	24	40	82	28	43	38	15	82	20
J. C. P.	33	12	38	32	35	30	41	83	30	44	34	15	82	20
Honor Bright	33	10	39	30	31	27	40	80	30	45	34	20	80	19
M & W	32	11	38	33	34	27	43	86	30	47	36	16	86	20
Penrod	32	11	38	31	37	35	41	85	30	46	37	20	85	20
True Blue	33	11	40	32	35	34	43	88	32	49	34	16	88	20
Tom Sawyer	32	14	36	35	38	34	44	88	30	45	32	11	85	19
Top Flight	33	11	38	32	36	36	43	88	30	46	36	15	86	21
Body meas. age 12	34.26	9.81	34.87	26.93	30.29	35.47	39.86	73.83	24.57	54.55	22.72	24.75	75.69	
Size 12														
Thrift Quality	33	10	39	34	35	25	43	87	30	46	35	19	86	19
Super Oxhide	33	12	44	35	37	32	44	89	34	45	38	19	88	21
Red Cap	32	12	46	34	36	34	45	95	30	47	40	14	84	22
J. C. P.	34	12	42	34	37	35	47	90	30	48	36	16	86	21
Honor Bright	34	10	42	31	39	29	42	86	31	49	38	25	86	19
M & W	34	11	39	34	36	29	44	89	29	51	37	16	90	21
Penrod	34	12	39	36	39	30	45	91	31	49	35	15	88	20
True Blue	34	11.	42	33	38	35	44	89	32	51	38	16	91	20
Tom Sawyer	34	15	40	36	41	36	46	93	35	49	36	14	90	19
Top Flight	34	11	42	33	39	38	47	96	33	52	40	15	92	21

Table 9. (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest front	Chest back	Under-arm length	Chest girth: at armscye front	Chest girth	Elbow girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Body meas. age 13	35.15	10.39	36.39	27.88	31.65	37.13	41.74	77.33	25.46	56.46	23.85	24.91	79.87	
Size 12½														
Thrift Quality	34	11	43	36	38	30	47	94	32	51	40	17	90	19
Super Oxhide	35	12	46	35	40	34	48	96	35	50	41	19	96	24
Red Cap	34	12	46	38	39	40	49	98	36	51	40	14	96	20
J. C. P.	35	13	46	35	38	35	45	91	34	51	40	15	88	21
Honor Bright	35	11	41	31	34	28	41	85	30	49	36	20	87	20
M & W	35	12	42	35	36	31	45	90	24	53	38	15	90	21
Penrod	33	12	46	33	38	35	46	91	35	52	44	15	94	20
True Blue	35	13	46	35	39	36	47	95	34	54	40	20	92	21
Tom Sawyer	33	15	46	34	40	36	46	93	34	55	41	18	90	20
Top Flight	35	12	44	34	39	38	47	96	34	53	40	15	96	21
Body meas. age 13	35.15	10.39	36.39	27.88	31.65	37.13	41.74	77.33	25.46	56.46	23.85	24.91	79.87	
Size 13														
Thrift Quality	35	12	45	36	39	30	48	96	34	53	44	16	94	20
Super Oxhide	36	13	48	35	40	35	48	98	35	54	42	14	96	23
Red Cap	36	13	46	40	40	42	49	98	36	52	42	16	94	24
J. C. P.	36	13	50	36	40	35	48	96	36	53	46	15	92	22
Honor Bright	35	12	48	36	38	35	46	95	36	53	44	15	96	21
M & W	36	13	44	36	38	34	46	92	32	55	40	16	92	20
Penrod	35	13	45	36	40	37	49	98	36	52	46	14	100	20
True Blue	36	13	50	36	40	37	49	99	36	55	47	19	100	21
Tom Sawyer	35	15	48	37	42	40	49	95	35	58	43	19	96	21
Top Flight	36	13	44	35	42	40	51	102	36	56	44	14	100	22

Table 9. (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest: girth	Elbow girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Body meas. age 14	36.33	10.62	37.86	29.03	32.3	38.16	43.17	79.33	26.3	58.67	24.26	24.61	82.47	
Size 13½														
Thrift Quality	36	12	45	37	40	39	48	97	34	58	46	16	98	21
Super Oxhide	37	14	51	37	42	37	52	107	35	58	44	15	104	24
Red Cap	38	14	48	41	43	45	52	104	38	58	45	13	104	24
J. C. P.	37	13	50	39	42	37	48	98	37	55	48	15	96	23
Honor Bright	37	13	49	37	40	37	49	97	37	55	46	18	98	20
M & W	37	14	48	38	40	35	48	96	34	59	42	16	94	22
Penrod	36	15	52	38	44	39	51	104	35	59	44	18	103	21
True Blue	37	13	54	37	41	40	51	102	36	56	48	15	102	21
Tom Sawyer	35	17	49	36	46	39	51	97	36	59	44	15	102	21
Top Flight	37	13	50	36	42	42	51	102	36	57	46	14	104	23
Body meas. age 14	36.33	10.62	37.86	29.03	32.3	38.16	43.17	79.33	26.3	58.67	24.26	24.61	82.47	
Size 14														
Thrift Quality	37	13	50	38	42	30	50	100	36	61	48	16	100	21
Super Oxhide	38	14	50	38	42	40	54	108	36	58	46	15	104	21
Red Cap	39	15	49	43	45	46	55	110	39	55	44	17	108	24
J. C. P.	38	14	51	40	42	38	50	100	38	58	48	15	100	28
Honor Bright	37	14	50	38	43	39	51	103	38	59	48	11	100	21
M & W	38	14	48	40	41	36	50	100	36	61	44	17	100	22
Penrod	36	15	52	41	46	39	54	110	39	61	46	18	108	21
True Blue	39	14	56	38	43	42	52	104	39	60	49	14	104	22
Tom Sawyer	36	17	48	40	47	42	53	106	38	61	44	14	108	21
Top Flight	38	14	52	38	45	44	53	106	38	61	48	15	106	24

Table 10. A comparison in centimeters of the mean body measurements for a certain age with the measurements of trousers of the corresponding size.

	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Body meas. age 6	53.79	60.27	29.35	33.95	25.19	49.36	71.41	51.37	80.38
Size 6									
Ind. Uniform	64	90	52	54	44	48	74	55	80
K T Togs	61	81	46	56	45	62	72	51	75
Play Pants	63	88	48	54	46	59	73	52	77
Scotts Best	64	89	48	54	45	62	86	60	90
Dress Pants	62	88	50	45	43	62	69	48	73
Cords	60	88	48	52	42	61	67	45	70
Doeskin	67	96	52	56	46	54	72	54	74
Keen Boy	60	91	50	56	48	61	83	61	86
Man-O'-Fashion	62	94	50	58	46	63	80	58	84
Tom Sawyer	59	80	40	45	40	58	81	45	86
Body meas. age 8	56.81	65.29	31.88	37.13	27.40	52.81	80.31	58.23	89.87
Size 8									
Ind. Uniform	68	94	54	56	46	59	79	57	84
K T Togs	63	96	50	60	47	65	78	56	81
Play Pants	64	98	54	56	47	64	80	56	83
Scotts Best	65	90	50	56	46	64	87	64	92
Dress Pants	66	96	54	58	46	64	80	59	84
Cords	65	94	50	56	44	64	82	59	85
Doeskin	68	97	54	59	48	56	76	56	79
Keen Boy	62	93	52	58	49	63	85	62	88
Man-O'-Fashion	64	96	52	60	49	65	82	60	86
Tom Sawyer	60	84	43	46	45	64	82	60	87

Table 10 (cont.)

	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Body meas. age 10	58.97	70.03	34.23	39.75	29.38	56.69	87.07	63.57	96.71
Size 10									
Ind. Uniform	69	96	56	58	48	63	86	62	90
K T Togs	67	100	52	62	48	69	89	65	92
Play Pants	68	100	56	58	48	67	86	61	88
Scotts Best	67	91	52	60	49	68	89	64	93
Dress Pants	67	100	56	60	57	67	87	64	92
Cords	66	96	52	59	46	67	88	64	92
Doeskin	69	99	54	60	50	61	83	61	87
Keen Boy	64	94	52	61	51	67	89	65	94
Man-O'-Fashion	68	100	54	61	50	67	89	64	95
Tom Sawyer	61	95	52	60	48	66	90	65	93
Body meas. age 12	62.31	75.69	37.79	43.93	32.11	61.25	95.11	69.95	105.87
Size 12									
Ind. Uniform	72	100	57	59	50	65	91	67	96
K T Togs	73	104	53	65	50	73	98	71	101
Play Pants	70	102	58	60	49	68	93	67	104
Scotts Best	71	94	52	60	50	69	100	73	105
Dress Pants	70	101	57	61	58	71	94	68	98
Cords	68	99	53	61	48	71	93	68	97
Doeskin	72	100	56	62	50	63	95	70	99
Keen Boy	68	96	54	62	53	68	95	69	99
Man-O'-Fashion	69	104	56	62	52	70	96	70	100
Tom Sawyer	63	98	53	64	50	69	94	70	99
Body meas. age 14	66.09	82.47	40.71	46.77	33.99	65.65	102.01	75.29	113.07
Size 14									
Ind. Uniform	75	104	60	62	52	68	97	72	102
K T Togs	73	110	56	66	52	76	102	73	117
Play Pants	72	104	60	64	50	72	102	75	104
Scotts Best	73	93	47	64	52	72	111	84	115
Dress Pants	70	102	58	61	58	72	101	74	104
Cords	70	102	55	64	52	73	100	75	105
Doeskin	74	107	58	64	54	65	101	75	104
Keen Boy	72	98	56	64	56	71	101	75	105
Man-O'-Fashion	71	108	58	64	54	72	100	75	104
Tom Sawyer	70	104	56	64	52	72	98	73	104

A Comparison of Body Measurements with the Corresponding Garment Measurements

When making comparisons of body and garment measurements it is necessary to provide for such minimum tolerances as are required for ease of fit and comfort. The tolerances here allowed are similar to those required for adults. Some of the allowed tolerances are taken from those recommended by Latzke and Quinlan (1935), others are estimates drawn from information acquired from mothers of boys, nursery school teachers, and merchants.

The tolerances allowed in this study are as follows:

Girth of neck.....	1	centimeter
Shoulder length.....	1 to 2	"
Armscye.....	4 " 6	"
Girth of chest, front,.....	4	"
Girth of chest, back,.....	4	"
Girth " " at armscye.....	10	"
Girth " " " " ,front	5	"
Girth of elbow.....	10	"
Length of arm.....	3	"
Under-arm length, must equal body measurements		
Girth of arm at armscye..... (width of sleeve cap)	10	"
Girth of hips.....	10	"
Girth of cuff.....	4	"
Girth of waist.....	4	"
Width of hips, back.....	4-6	"
Girth of thigh.....	10	"
Girth of knee.....	10	"
Length of crotch.....	10	"

Since the body measurements were taken from the floor, no tolerance was allowed for the side length, the inseam length and the back length. In reality a tolerance of 4 to 8 centimeters exists.

A comparison of the body measurements with the actual garment measurements based on size and corresponding age, showed that, in shirts, the neck band was in most cases inadequate, in cases where it was not actually smaller than the neck measurements, it was barely 1/2 centimeter larger. When size $12\frac{1}{2}$ was compared with age 13 and size $13\frac{1}{2}$ with age 14, the neck band was found to be adequate. The armscye was large enough in nearly all cases, since it varied from 4 to 15 centimeters in size, 7 centimeters being the mean difference for all sizes and brands. The shoulder length was adequate in practically all cases. Some brands ran slightly over 2 centimeters longer than body measurements, but the average was between 1.5 and 2.5 centimeters.

In all cases the chest measurements were adequate. However, there were wide variations in the same brand and among the garments of the same size. The under arm lengths were found to be inadequate. In only a few cases were the underarm measurements as long as the body measurement. This measurement varied greatly within the brand, especial-

ly in the cheaper shirts. The arm girth measurements were adequate in all cases, but the sleeve length was uniformly inadequate. The hip girth was adequate and the cuff girth was quite uniform. The slope of the shoulder varied on boys from 24 to 26 degrees and on garments from 15 to 18 degrees. Discrepancies of as much would indicate poorly fitted shoulders.

In the trousers, the waist band was found to be from 4 to 10 centimeters larger than the actual waist girth. The prevailing fashion of wearing the trousers low on the hip bones may be responsible for this difference. In many cases elastic gussets were found in the band under the belt. The hip measurements were adequate, the style of pleats in the trousers below the band making this possible. The back width was in all cases adequate. The thigh and knee was also large enough in all brands and sizes. The crotch length was, on the average, adequate but a few brands seemed to be short on this seam. The side length, on the average was adequate, great variation being found between brands and sizes within the brand, on both the side and back length. The back length was found to be inadequate in most cases. There seemed to be no relationship between the back and side lengths as one might be found

adequate and the other inadequate on the same garment in a number of cases.

The average child as here presented would require at least one size larger in a shirt than suggested by his age in order to have sufficient neck girth, sleeve length and underarm length. For trousers one size larger would be required to give leg length. In this larger size, however, the waist band would tend to be large.

The difference expressed in centimeters between the mean of body measurements and the mean of garment measurements as well as actual differences from size to size in the different brands are shown are shown in Tables 11 and 12.

DISCUSSION

In this study gradual growth increments were found to exist in the body measurements of the boys selected for this study. At the age of 6 years very little difference was found between the measurements of boys and girls of the same age, as compared with the findings of Ulrich (1938). During the years studied boys were found assuming proportions that were characteristic of their sex. The most striking example is the squaring of the shoulders

Table 11. A comparison of mean body measurements in centimeters and mean shirt measurements as well as measurements of individual garments.

	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest: girth	Elbow: girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Mean Body meas. (age 6)	29.31	7.77	27.23	21.48	25.75	28.76	31.24	60.65	19.73	41.42	18.04	25.85	60.27	
Mean garment size (size 6)	29.60	9.65	35.20	28.55	31.40	28.70	38.60	78.20	28.20	40.50	31.60	18.60	76.60	18.50
Difference	+.29	1.88	7.97	7.37	5.65	-.96	7.36	17.55	8.47	-.92	13.56	-7.25	16.33	
Size 6														
Thrift Quality	-.31	1.23	8.77	8.52	5.25	-4.76	8.76	20.60	8.27	-1.42	15.96	-5.85	1.73	
Super Oxhide	.69	1.23	15.77	5.52	4.25	.76	7.76	18.60	10.27	-.42	15.96	-12.85	6.73	
Red Cap	.69	1.23	14.77	5.52	3.25	-2.76	6.76	18.60	12.27	-1.42	19.96	-7.85	15.73	
J. C. P.	.69	1.23	6.77	7.52	5.25	-2.76	4.76	13.60	6.27	-1.42	9.96	-5.85	13.73	
Honor Bright	.69	2.23	8.77	6.52	4.25	-2.76	4.76	9.60	7.27	-1.42	11.96	-5.85	15.73	
M & W	.69	1.73	4.77	8.02	4.25	-2.76	7.76	18.60	7.27	-2.42	11.96	-5.85	15.73	
Penrod	-.31	2.23	4.77	8.52	8.25	3.24	6.76	20.60	8.27	+2.58	10.96	-7.85	17.73	
True Blue	.69	1.73	5.77	5.52	4.25	4.24	10.76	24.60	7.27	-.42	10.96	-7.85	18.73	
Tom Sawyer	-1.31	5.73	2.77	9.52	9.25	5.24	6.76	20.60	7.27	-1.42	9.96	-5.85	19.73	
Top Flight	+ .69	1.73	6.77	6.52	8.25	3.24	8.76	22.60	10.27	-1.42	17.96	-5.85	19.73	
Mean Body meas. (age 8)	32.40	8.55	29.87	23.25	27.13	31.06	34.19	64.89	21.15	46.02	19.55	24.25	65.29	
Mean garment size (size 8)	31.00	10.25	36.70	30.50	33.50	29.85	40.20	80.70	29.00	42.05	33.30	16.90	79.80	19.40
Difference	-1.40	1.70	6.83	7.25	6.37	-1.21	6.01	15.81	7.85	-3.97	13.75	-7.35	14.51	
Size 8														
Thrift Quality	-2.40	.45	7.13	6.75	4.87	-7.06	5.81	15.45	7.85	-4.02	14.45	-5.25	14.71	
Super Oxhide	-1.40	1.45	12.13	8.75	6.87	-3.06	6.81	17.45	8.85	-4.02	16.45	-10.25	13.71	
Red Cap	-1.40	2.45	14.13	6.75	4.87	+0.44	7.81	19.45	10.85	-4.02	20.45	-10.25	16.71	
J. C. P.	-.40	2.45	6.13	7.75	5.87	-3.06	4.81	14.45	6.85	-5.02	12.45	-10.25	10.71	
Honor Bright	-1.40	1.45	7.13	4.75	3.87	-5.06	3.81	5.45	6.85	-5.02	12.45	-5.25	12.71	
M & W	-1.40	1.45	4.13	6.75	3.87	-7.06	5.81	15.45	5.85	-4.02	12.45	-7.25	14.71	
Penrod	-2.40	1.45	5.13	7.75	8.87	+2.94	4.81	17.45	8.85	-.52	10.45	-7.25	14.71	
True Blue	-0.40	.95	4.13	6.75	6.87	+2.94	7.81	19.45	6.85	-4.02	10.45	-7.25	14.71	
Tom Sawyer	-2.40	4.45	2.13	9.75	8.87	+3.49	5.81	17.45	6.85	-5.02	10.45	-15.25	15.71	
Top Flight	-0.40	.45	6.13	6.75	8.87	+2.94	6.81	19.45	8.85	-4.02	17.45	-5.25	16.71	

Table 11. (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye front	Chest: girth	Elbow: girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Mean body meas. (age 10)	33.06	9.25	31.88	24.70	28.69	32.87	36.12	68.67	22.38	49.97	20.77	24.92	70.03	
Mean garment (size 10)	32.20	11.20	39.20	32.15	34.95	30.20	42.00	85.40	30.30	45.10	35.60	16.30	84.80	20.00
Difference	-.86	1.95	7.32	7.45	6.26	-2.67	5.88	16.73	7.92	-4.87	14.83	-8.62	14.77	
Size 10														
Thrift Quality	-1.06	.75	6.12	8.30	5.31	-5.87	5.88	18.33	7.62	-5.97	15.23	-5.92	15.97	
Super Oxhide	-1.06	1.75	12.12	9.30	7.31	-4.87	6.88	18.33	10.62	-7.97	18.23	-7.92	17.97	
Red Cap	-3.06	1.75	10.12	5.30	5.31	-8.87	3.88	13.33	5.62	-6.97	17.23	-9.92	11.97	
J. C. P.	-0.06	2.75	6.12	7.30	6.31	-2.87	4.88	14.33	7.62	-5.97	13.23	-9.92	11.97	
Honor Bright	-0.06	.75	7.12	4.80	2.31	-5.87	3.88	11.33	7.62	-4.97	12.23	-4.92	9.97	
M & W	-1.06	1.75	6.12	8.30	5.31	-5.87	6.88	17.33	7.62	-2.97	15.23	-8.92	15.97	
Penrod	-1.06	1.75	6.12	6.30	8.31	+2.13	4.88	16.33	7.62	-3.97	16.23	-4.92	14.97	
True Blue	-0.06	1.75	8.12	7.30	6.31	+1.13	6.88	19.33	9.62	-.97	13.23	-8.92	17.97	
Tom Sawyer	-1.06	4.75	4.12	10.30	8.81	+1.13	7.88	19.33	7.62	-4.97	11.23	-14.92	14.97	
Top Flight	-0.06	1.75	6.12	7.30	7.31	+3.13	6.88	19.33	7.62	-3.97	15.23	-9.92	15.97	
Mean body meas. (age 12)	34.26	9.81	34.87	26.93	30.29	35.47	39.86	73.83	24.57	54.55	22.72	24.77	75.69	
Mean garment (size 12)	33.60	11.60	41.50	33.95	37.10	32.30	44.40	90.50	31.40	48.65	37.30	16.90	88.10	20.20
Difference	-.66	1.79	6.63	7.02	6.81	-3.17	4.54	16.67	6.83	-.90	14.58	-7.87	12.41	
Size 12														
Thrift Quality	-1.26	.19	4.13	7.07	4.71	-10.47	3.14	13.17	5.43	-8.55	12.28	-5.75	10.31	
Super Oxhide	-1.26	2.19	9.13	8.07	6.71	-3.47	4.14	15.17	9.43	-9.55	15.28	-5.75	12.31	
Red Cap	-2.26	2.19	11.13	7.07	5.71	-1.47	5.14	21.17	5.43	-7.55	17.28	-10.75	8.31	
J. C. P.	-0.26	2.19	7.13	7.07	6.71	-.47	7.14	16.17	5.43	-6.55	13.28	-8.75	10.31	
Honor Bright	0.26	0.19	7.13	4.07	2.71	-6.47	2.14	12.17	6.43	-6.05	15.28	+0.25	10.31	
M & W	-0.26	1.19	4.13	2.57	5.71	-6.47	4.14	15.17	4.43	-3.55	14.28	-8.75	14.31	
Penrod	-0.26	2.19	4.13	9.07	8.71	-5.47	5.14	17.17	5.93	-5.55	12.28	-9.75	12.31	
True Blue	-0.26	1.19	7.13	6.07	7.71	-0.47	4.14	15.17	7.43	-3.55	15.28	-8.75	15.31	
Tom Sawyer	-0.26	5.19	5.13	9.07	10.71	+0.53	6.14	19.17	10.43	-5.55	13.28	-10.75	15.31	
Top Flight	-0.26	1.19	7.13	6.07	8.71	+2.53	7.14	22.17	8.43	-2.55	17.28	-9.75	17.31	

Table 11. (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest: front	Chest: back	Under-arm length	Chest girth: at armscye: front	Chest girth	Elbow girth	Arm length	Arm girth: at armscye	Shoulder slope°	Hip girth	Cuff girth
Mean body meas. (age 13)	35.15	10.39	36.39	27.88	31.65	37.13	41.74	77.33	25.46	56.46	23.85	24.91	79.87	
Mean garment (size 12½)	34.35	12.25	44.55	34.55	38.10	34.30	46.10	92.90	33.30	51.85	40.00	16.80	91.90	20.80
Difference	-0.80	1.86	8.16	6.67	6.45	-2.83	4.36	15.57	7.94	-4.61	16.15	-7.01	11.03	
Size 12½														
Thrift Quality	-1.15	0.61	6.61	8.12	6.35	-7.13	5.26	16.67	6.54	-5.46	16.15	-7.91	10.13	
Super Oxhide	-0.15	1.61	9.61	7.12	8.35	-3.13	6.26	18.67	9.54	-6.46	17.15	-5.91	16.13	
Red Cap	-1.15	1.61	9.61	10.12	7.35	+2.87	7.26	20.67	10.54	-5.46	16.15	-10.91	16.13	
J. C. P.	-0.15	2.61	9.61	7.12	6.35	-2.13	3.26	13.67	8.54	-5.46	16.15	-9.91	8.13	
Honor Bright	-0.65	0.61	4.61	3.12	2.35	-9.13	-0.74	7.67	4.54	-7.46	12.15	-4.91	7.13	
M & W	-0.15	1.61	5.61	6.62	4.35	-6.13	3.26	12.67	3.54	-3.46	14.15	-9.91	10.13	
Penrod	-2.15	1.61	9.61	5.12	6.35	-2.13	4.26	13.67	9.54	-4.96	20.15	-9.91	14.13	
True Blue	-0.15	2.11	9.61	7.12	7.35	-1.13	5.26	17.67	8.54	-2.46	16.15	-4.91	12.13	
Tom Sawyer	-2.15	4.61	9.11	6.12	8.35	-1.13	4.26	15.67	8.54	-1.46	17.15	-6.91	10.13	
Top Flight	-0.15	1.61	7.61	6.12	7.35	+0.87	5.26	18.67	8.54	-3.46	16.15	-9.91	16.13	
Mean body meas. (age 13)	35.15	10.39	36.39	27.88	31.65	37.13	41.74	77.33	25.46	56.46	23.85	24.91	79.87	
Mean garment (size 13)	35.60	13.00	46.80	36.20	39.85	36.50	48.30	96.90	35.20	54.10	43.80	-15.70	96.00	21.30
Difference	.45	2.61	10.41	8.32	8.20	-.63	6.56	19.57	9.74	-2.36	19.95	-9.21	16.13	
Size 13														
Thrift Quality	-.15	1.61	8.61	8.12	7.35	-7.13	6.26	18.67	8.54	-3.46	20.15	-8.91	14.13	
Super Oxhide	+.85	2.61	11.61	7.12	8.35	-2.13	6.26	20.67	9.54	-2.46	18.15	-10.91	16.13	
Red Cap	+.85	2.61	9.61	12.12	8.35	+4.87	7.26	20.67	10.54	-4.46	18.15	-8.91	14.13	
J. C. P.	+.85	2.61	13.61	8.12	8.35	-2.13	6.26	18.67	10.54	-3.46	22.15	-9.91	12.13	
Honor Bright	-.15	1.61	11.61	8.12	6.35	-2.13	4.26	17.67	10.54	-3.46	20.15	-9.91	16.13	
M & W	+.85	2.61	7.61	7.62	5.85	-3.13	4.26	14.67	6.54	-1.46	16.15	-8.91	12.13	
Penrod	-.15	2.61	8.61	8.12	8.35	-.13	7.26	20.67	10.54	-4.46	22.15	-10.91	20.13	
True Blue	+.85	2.61	13.61	8.12	8.35	-.13	7.24	21.67	10.54	-1.46	23.15	-5.91	20.13	
Tom Sawyer	-.15	4.61	11.61	8.62	10.35	+2.87	7.26	17.67	9.54	+1.54	19.15	-6.41	16.13	
Top Flight	+.85	2.61	7.61	7.12	10.35	+2.87	9.26	24.67	10.54	-.46	20.15	-10.91	20.13	

Table 11 (cont.)

	Neck girth	Shoulder length	Arms-cye	Chest front	Chest back	Under-arm length	Chest girth at armscye front	Chest girth	Elbow girth	Arm length	Arm girth at armscye	Shoulder slope°	Hip girth	Cuff girth
Mean body meas. (age 14)	36.33	10.62	37.86	29.03	32.30	38.16	43.17	79.33	26.30	58.67	24.26	24.61	82.47	
Mean garment (size 13½)	36.70	13.75	49.60	37.75	41.95	39.00	50.10	100.40	35.80	57.10	45.30	15.50	100.50	22.00
Difference	.36	3.13	11.74	8.72	9.65	.84	6.83	20.07	9.50	-1.57	21.04	-9.11	18.03	
Size 13														
Thrift Quality	-.33	1.38	7.14	7.47	7.70	+.84	4.83	17.67	7.70	-.67	21.74	-8.61	15.53	
Super Oxhide	+.67	3.38	13.14	7.97	9.70	-1.16	7.83	27.67	8.70	-.67	19.74	-9.61	21.53	
Red Cap	+1.67	3.38	10.14	11.97	10.70	+6.84	7.83	24.67	11.70	-.67	20.74	-11.61	21.53	
J. C. P.	+ .67	2.38	12.14	9.97	9.70	-1.16	4.83	18.67	10.70	-3.67	23.74	-9.61	13.53	
Honor Bright	+.67	2.38	11.14	7.97	7.70	-1.16	5.83	17.67	10.70	-3.67	21.74	-6.61	15.53	
M & W	+.67	2.88	10.14	8.97	7.20	-3.16	4.83	16.67	7.70	+.33	17.74	-8.61	11.53	
Penrod	-.33	4.38	14.14	8.97	11.70	+.84	7.83	24.67	8.70	+.33	19.74	-6.61	20.53	
True Blue	+.67	2.38	16.14	7.97	8.70	+1.84	7.83	22.67	9.70	-2.67	23.74	-9.61	19.53	
Tom Sawyer	-1.33	6.38	11.14	6.97	13.70	+.84	7.83	17.67	9.70	+.33	19.74	-9.61	19.53	
Top Flight	+.67	2.38	12.14	6.97	9.70	+3.84	7.83	22.67	9.70	-1.67	21.74	-10.61	21.53	
Mean body meas. (age 14)	36.33	10.62	37.86	29.03	32.30	38.16	43.17	79.33	26.30	58.67	24.26	24.61	82.47	
Mean garment (size 14)	37.60	14.40	50.60	39.40	43.60	39.60	52.20	104.70	37.70	59.50	46.50	15.20	103.80	22.00
Difference	1.27	3.78	12.74	9.37	11.30	1.44	9.03	25.37	11.40	.93	22.24	-9.41	21.33	
Size 14														
Thrift Quality	+.67	2.38	12.14	8.97	9.70	-8.16	6.83	20.67	9.70	+2.33	23.74	-8.61	17.53	
Super Oxhide	+1.67	3.38	12.14	8.97	9.70	+1.84	10.83	28.67	9.70	-.67	21.74	-9.61	21.53	
Red Cap	+2.67	4.38	11.14	13.97	12.70	+7.84	11.83	30.67	12.70	-3.67	19.74	-7.61	25.53	
J. C. P.	+1.67	3.38	13.14	10.97	9.70	-.16	6.83	20.67	11.70	-.67	23.74	-9.61	17.53	
Honor Bright	+.67	3.38	12.14	8.97	10.70	+.84	7.83	23.67	11.70	+.33	23.74	-13.61	17.53	
M & W	+1.67	3.38	10.14	10.97	8.70	-2.16	6.83	20.67	9.70	+2.33	19.74	-7.61	17.53	
Penrod	-.33	4.38	14.14	11.97	13.70	+.84	10.83	30.67	12.70	+2.33	21.74	-6.61	25.53	
True Blue	+2.67	3.38	18.14	8.97	10.70	+3.84	8.83	24.67	12.70	+1.33	24.74	-10.61	21.53	
Tom Sawyer	-.33	6.38	10.14	10.97	14.70	+3.84	9.83	26.67	11.70	+2.33	19.74	-10.61	25.53	
Top Flight	+1.67	3.38	14.14	8.97	12.70	+5.84	9.83	26.67	11.70	+2.33	23.74	-9.61	23.53	

Table 12. A comparison of mean body measurements in centimeters and mean trouser measurements as well as measurements of individual garments.

	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Mean body meas. (age 6)	53.79	60.27	29.35	33.95	25.19	49.36	71.41	51.37	80.38
Mean garment (size 6)	62.20	88.50	48.40	52.95	44.50	58.95	75.70	52.80	79.45
Difference	8.41	28.23	19.05	19.00	19.31	9.59	4.29	1.43	-0.93
Size 6									
Ind. Uniform	10.21	29.73	22.65	20.05	18.81	1.36	2.59	+3.63	-.38
K T Togs	7.21	20.73	16.65	21.05	19.81	+12.64	.59	-.87	-5.38
Play Pants	9.21	27.73	18.65	20.05	20.81	+9.64	1.59	+.63	-3.38
Scotts Best	10.21	28.73	18.65	20.05	19.81	+12.64	14.59	+8.63	+9.62
Dress Pants	8.21	27.73	20.65	11.05	17.81	+12.64	-2.41	-3.37	-7.38
Cords	6.21	27.73	18.65	18.05	16.81	+11.64	-4.41	-6.37	-10.38
Doeskin	13.21	35.73	22.65	22.05	20.81	+4.64	.59	+2.63	+6.38
Keen Boy	6.21	30.73	20.65	22.05	22.81	+11.14	11.59	+9.23	+5.62
Man-O'-Fashion	8.21	33.73	20.65	24.05	20.81	+13.64	8.59	+6.63	+3.62
Tom Sawyer	5.21	19.73	10.65	11.05	14.81	+8.64	9.59	-6.37	+5.12
Mean body meas. (age 8)	56.81	65.29	31.88	37.13	27.40	52.81	80.31	58.23	89.87
Mean garment (size 8)	64.40	93.70	51.25	56.45	46.70	62.90	81.00	58.80	84.74
Difference	7.59	28.41	19.37	19.32	19.30	10.09	.69	.57	-5.13
Size 8									
Ind. Uniform	11.19	28.71	22.12	18.87	18.60	6.19	-1.81	-1.23	-6.37
K T Togs	6.19	30.71	18.12	22.87	19.60	12.19	-2.31	-2.23	-9.37
Play Pants	7.19	32.71	22.12	18.87	19.60	10.69	-0.31	-2.23	-6.87
Scotts Best	8.19	24.71	18.12	18.87	18.60	11.19	+6.69	-5.77	+2.13
Dress Pants	8.69	30.71	22.12	20.87	18.60	11.19	-0.31	+0.27	-5.87
Cords	8.19	28.71	18.12	18.87	16.60	11.19	+1.19	+0.77	-4.87
Doeskin	11.19	31.71	22.12	21.87	20.60	3.19	-4.31	-2.23	-10.87
Keen Boy	5.19	27.71	20.12	20.87	21.6	10.19	+4.69	+3.77	-1.87
Man-O'-Fashion	7.19	30.71	20.12	22.87	21.60	12.19	+1.69	+1.77	-3.87
Tom Sawyer	2.69	18.21	10.62	7.37	17.60	10.69	+1.19	+1.27	-3.37

Table 12. (cont.)

	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Mean body meas. (age 10)	58.97	70.03	34.23	39.75	29.38	56.69	87.07	63.57	96.71
Mean garment (size 10)	66.50	97.30	53.60	59.85	49.40	66.00	87.45	63.25	91.35
Difference	7.53	27.27	19.37	20.10	20.02	9.31	0.38	-0.32	-5.36
Size 10									
Ind. Uniform	10.03	25.97	21.27	17.75	18.62	6.31	-1.57	-2.07	-7.21
K T Togs	8.03	29.97	17.77	22.25	18.62	11.81	+1.93	+1.43	-4.71
Play Pants	8.53	29.47	21.77	18.75	18.62	10.31	-1.07	-3.07	-8.71
Scotts Best	8.03	20.97	17.77	20.75	19.62	11.31	+1.43	+.43	-3.71
Dress Pants	8.03	29.97	21.77	20.75	27.62	9.81	-.07	-.07	-5.21
Cords	7.03	25.97	17.77	19.75	16.62	10.31	+.43	+.43	-5.21
Doeskin	10.03	28.97	19.77	20.75	20.62	4.31	-4.07	12.57	-9.71
Keen Boy	4.53	23.97	17.77	21.75	21.62	9.81	+1.93	+.93	-2.71
Man-O'-Fashion	9.03	29.97	19.77	21.75	20.62	10.31	+1.93	+.43	-2.21
Tom Sawyer	1.53	24.47	17.27	20.75	18.62	8.81	+2.93	+.93	-4.21
Mean body meas. (age 12)	62.31	75.69	37.79	43.93	32.11	61.25	95.11	69.95	105.87
Mean garment (size 12)	69.50	99.70	54.80	61.60	50.95	68.60	95.55	69.10	99.60
Difference	7.19	24.01	17.01	17.67	17.84	7.35	0.44	-0.85	-6.27
Size 12									
Ind. Uniform	9.69	24.31	19.21	15.07	17.89	3.75	-4.11	-2.95	-9.87
K T Togs	10.69	28.31	15.21	21.07	17.89	11.75	+2.39	+.55	-4.87
Play Pants	7.19	26.31	20.21	16.07	16.89	6.75	-2.11	-2.95	-1.87
Scotts Best	8.69	17.81	14.21	16.07	16.39	7.75	4.89	+3.05	-1.37
Dress Pants	7.69	25.31	19.21	17.07	25.89	9.25	-1.11	-2.45	-8.37
Cords	5.69	23.31	15.21	17.07	15.89	9.75	-2.11	-1.95	-8.87
Doeskin	9.69	24.31	18.21	18.07	17.89	1.75	-.11	+.05	-6.87
Keen Boy	5.19	20.31	16.21	18.07	20.89	6.75	-.61	-1.45	-7.37
Man-O'-Fashion	6.69	28.31	18.21	18.07	19.89	8.75	+.89	-.45	-5.87
Tom Sawyer	0.19	21.81	14.71	20.07	17.89	7.25	-1.61	+.05	-7.37

Table 12. (cont.)

	Waist girth	Hip girth	Hip width back	Thigh girth	Knee girth	Crotch length	Side length	Inseam	Back length
Mean body meas. (age 14)	66.09	82.47	40.41	46.77	33.99	65.65	102.01	75.29	113.07
Mean garment (size 14)	71.85	103.10	56.30	63.70	53.20	71.20	101.00	75.65	106.35
Difference	5.76	20.63	15.99	16.93	19.21	5.55	-1.01	0.36	-6.72
Size 14									
Ind. Uniform	8.91	21.53	19.29	15.23	18.01	2.35	-5.01	-3.79	-11.07
K T Togs	6.91	27.53	15.29	19.23	18.01	10.35	-0.01	-2.29	3.93
Play Pants	5.41	21.53	19.29	17.23	16.01	6.35	-0.01	-0.29	-9.07
Scotts Best	6.41	10.03	5.79	17.23	18.01	5.85	+8.49	+8.71	1.93
Dress Pants	3.91	19.53	17.29	14.23	24.01	6.35	-1.51	-1.79	-9.07
Cords	3.91	19.53	14.29	17.23	18.01	7.35	-2.01	-0.79	-8.07
Doeskin	7.91	24.53	17.29	17.23	20.01	-.65	-1.51	-0.29	-9.07
Keen Boy	5.41	15.53	15.29	17.23	22.01	5.35	-1.51	-0.29	-8.07
Man-O'-Fashion	4.91	25.53	17.29	17.23	20.01	6.35	-2.01	-0.79	-9.07
Tom Sawyer	3.91	21.03	15.29	17.23	18.01	5.85	-4.51	-2.29	-10.07

during the period from 8 to 14 years. Marked retardation of growth preceding adolescence was followed by a period of rapid growth during adolescence. Apparently the greatest growth had been reached by the thirteenth year, for the group of boys studied, since the fourteenth year shows a marked retardation. The most growth is recorded in body lengths, such as length of arms, legs and trunk. The neck girth increased rapidly. The girth of the legs, arms, and trunk seemed to increase less rapidly than the length measurements.

Great variations exist in the measurements of shirts and trousers of the same size made by various manufacturers. The firms furnishing specifications and measurements for the manufacture of their garments, seem to have the more nearly consistent sizes. Little relationship was found between the average proportions of boys and garments as indicated by a comparison of measurements. Certain measurements of garments were found to be 1 to 9 centimeters less than the corresponding body measurement without taking into account adequate tolerance for ease of movement. Other measurements were decidedly larger than the corresponding body measurement, notably that of the waist measurement.

CONCLUSIONS

Based upon the findings of this study, the following conclusions may be drawn:

1. Gradual increments of growth were found to exist in the body measurements of the boys studied.

2. Great variations exist in the measurements of boys' garments of the same size.

3. A garment, under the existing method of sizing, needs to be purchased one size larger than the age of the boy in order to have ample tolerance.

4. Little relationship was found between the average proportions of boys and garments as indicated by a comparison of measurements.

5. A definite need for garment size standardization is shown.

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